CANMET

Canada Centre for Mineral and Energy Technology

Centre canadien de la technologie des minéraux et de l'énergie

INDEX OF MINING TECHNOLOGY PROJECTS

1989

MINING RESEARCH LABORATORY

SP89-8E

Energy, Mines and Resources Canada

Énergie, Mines et Ressources Canada

THE ENERGY OF OUR RESOURCES

INDEX OF MINING TECHNOLOGY PROJECTS 1989

R.T. Blake, R. Boyle & S. Bezeau

Mining Methods and Evaluation Group

October 1989

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MINING RESEARCH LABORATORIES

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FOREWORD

In the mid-1980s, at the request of the Minister's National Advisory Committee to CANMET (MNACC), CANMET established a database of information on mining technology projects being undertaken in Canada. Since 1985 the Mining Research Laboratories (MRL) have published an Index of Mining Technology Projects annually.

The 1989 Index is the fifth edition. As in previous years, it contains information on research and development projects currently being carried out by mining companies, universities, federal and provincial agencies, and private sector organizations. Contributors are contacted regularly to update the information. At the same time, all sectors of the minerals industry are canvassed for new contributions.

Section 1 of the Index lists projects by organization, whereas Section 2 lists projects by subject category. This format has been well accepted. CANMET has been complimented both on the usefulness of the Index and on the manner in which it presents and classifies information that is not normally available in a published form.

Once again, we suggest that the Index be circulated more widely amongst technical personnel in companies and R&D establishments. We believe that there are potential users who do not fully benefit from this source of information.

The usefulness of the Index depends entirely on the participation of the mining research and technology development community. We trust that the inclination of companies to share technical information, as indicated by the growth of the Index over the past five years, will continue in the future. This participation should contribute to productivity increases and to greater international competitiveness for the Canadian mining industry.

Finally, I would like to thank all those who contributed to the 1989 version of the Index and ask for their continued support, as well as the input of new contributors, in the preparation of the 1990 Index.

John E. Udd

John E. Udd, Ph.D., P.Eng.
Director
Mining Research Laboratories

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INTRODUCTION

The majority of Canadian mines are located away from urban centres and, therefore, mine operators do not always have ready access to sources of technical information such as libraries, universities, government agencies and professional associations.

As a result, it is difficult for such people to keep up-to-date with advances in technology, new equipment and operating procedures. Often they find themselves "reinventing the wheel". Such duplication of effort is unhealthy for the balance sheet and also the national economy. It is a needless expense, particularly when metal prices are relatively low and unstable, national and international competition is becoming more fierce, and production costs are rising rapidly.

This problem was recognized by both Industry and Government in the mid-1980s and, because CANMET had always been non partisan, and its relationship with the industry at large almost always cordial, the Mining Research Laboratories (MRL) division of CANMET was asked by the National Advisory Committee to CANMET to establish an information system that would facilitate communications between operators and other segments of the industry on technology development projects.

Dr. Udd's foreword briefly explains the origin of the database and the format for the hard copy Index.

Although readers of previous editions were asked for suggestions on how to improve project categorization, relatively few responded; hence the invitation is reiterated.

Projects are categorized in 12 groups, and because of the difficulty in grouping the many facets of mining technology into just 12 categories, it was hoped to introduce four additional categories for the 1989 Index. Unfortunately, this could not be done and has been scheduled for 1990 when the database software is due for upgrading.

This latest Index has been compiled using information gathered during the spring and summer of 1989, by way of telephone conversations, mine visits and correspondence. Although the Index contains only information on mining projects currently being undertaken by industry, the data on projects that have been completed, postponed or

abandoned is preserved in the database. Moreover, Index information is available in the MINTEC data-base, accessible through QL Systems Ltd.

The majority of mine operators who were contacted had ongoing R & D projects. Some, however were without identifiable projects, and a few still remain to be convinced of the benefits of sharing this type of information. There is always some doubt about the definition of mining research and development and whether such projects differ from those operational improvements all mines strive for on a daily, monthly, or annual basis. For the purpose of this Index, all "research projects" submitted have been listed, including some pertaining to mineral processing, although
CANMET's Mineral Sciences Laboratories (MSL) compiles and publishes a similar index for technology projects in this field.

Without question, the management and staff at the majority of mining properties see the advantages of changing one or more aspects of their operations, to improve productivity and lower costs per unit mined. Other advantages of technical change include improved health and safety, better environmental controls and enhanced methods for resource conservation, to name a few.

Whatever the circumstances, most operators are trying to incorporate new technological concepts into their mine operations. Although similar, no two operations are exactly alike and therefore ideas implemented in one mine often cannot be used in another without some modification and, as a result, nearly every operator must undertake some original thinking on such matters. We believe that a publication such as the Index can help this process with its listing of technically related projects which, in the majority of cases, cannot be found in technical publications or regular commercially available technical databases.

It should be noted that CANMET does not possess detailed information on projects contained in the Index. For additional information, readers should contact the persons listed on the appropriate pages in Section 1 of the Index.

SECTION 1

Projects Listed by Organization

Afton Operating Corporation
P.O. Box 937
KAMLOOPS, BC,
V2C 5N4

George Thornton
Chief Engineer
Tel: (604) 374-5022
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Ore haulage road dust control methods.	3
2. Feasibility study on the purchase of larger haul trucks.	5

Blackdome Mining Corporation,
P.O. Box 549,
CLINTON, BC,
V0K 1K0

Peter Busse
Exc. VP Operations
Tel: (604) 684-6031
Fax: (604) 684-6031

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Design of 20 tph. surface mine backfill plant.	8

Brenda Mines Ltd.,
Brenda Mine,
P.O.Box 420,
PEACHLAND, BC,
V0H 1X0

Kerry M. Smith
Senior Mine Engineer
Tel: (604) 763-3220
Fax:

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
1. Reclamation work on tailings dam and waste dumps, including resloping and seeding.	3
2. Computerized surveying system for EDM using Autocad to update mine plan and store survey pick-ups.	4 , 11

Derek Perkins, Chief Chemist
Tel: (604) 763-3220

1. Evaluation of the effects of water flowing through surface waste rock dumps/piles.	3

Cominco Limited,
Polaris Mine,
POLARIS, NT,
X0A 0Y0

A.J. Keen,
Manager
Tel: (819) 253-6001
Fax: (819) 253-6039

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Pillar mining at the Polaris mine using frozen backfill. Ongoing search for ways to ensure steady supply of good quality backfill material.	7 , 10

Cominco Limited,
Sullivan Mine,
Box 2000,
KIMBERLEY, BC,
V1A 2G3

R.M. Henningson;
General Manager,
Tel: (604) 427-8221
Fax: (604) 427-8201

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Continuing the program to control diesel emissions underground by the gradual introduction of ceramic filters on all dieselized equipment.	9
2. Development of mine-wide computerized database system.	1
3. Continuation of a study to develop better mechanized mining methods for use in low dipping (20 to 40 deg.) pillar recovery mining operations.	4 , 7
4. Blast monitoring program.	7 , 11

Ron Van Ooteghem, Planning Engineer
Tel: (604) 427-8257

1. An evaluation of the Lynx 3D computer modelling system for use in mine planning and engineering services.	4 , 11

C.W. Shin, Mine Engineering Superintendent
Tel: (604) 427-8290

1. Continuing study for optimum ground support system in the main retreat caving front.	10

John Guselle, Mine Planning Engineer
Tel: (604) 427-8257

1. An investigation of blind boxhole drilling as an alternative to conventional slot-raise development. 7 , 5

Fording Coal Limited
Fording River Operations,
P.O. Box 100
ELKFORD, BC
V0B 1H0

D.A. Kennedy
Chief Mine Engineer
Tel: (604) 865-2271
Fax: (604) 865-4444

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Integrated shovel and drill monitoring system.	4 , 5
2. Feasibility evaluation of a coal transport conveyor.	2 , 8

Giant Yellowknife Mines Ltd.
Giant Mine
P.O. Bag 3000.
YELLOWKNIFE, NT,
X1A 2M2

G.A. Wolfe, P.Eng.
Chief Engineer,
Tel: (403) 873-6301
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Hydraulic reclamation of 10,000 tonnes per day of frozen tailings for the recovery of gold by the carbon-in-leach (CIL) process.	12

Nanisivik Mines Ltd.,
P.O. Box 225
NANISIVIK, NT,
X0A 0X0

J. McConnell
Mine Superintendant
Tel: (819) 436-7351
Fax: (819) 436-7435

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Continuing development of mining techniques in ice and permafrost conditions.	4
2. Removal of high (over 20 m) post-pillars from an existing open room and pillar stoping area (equipment and ground control considerations).	3

Westar Mining Ltd.,
Greenhills Operations,
P.O. Box 4000
ELKFORD, BC,
V0B 1H0

B. Bjornson
Superintendent Engineering
Tel: (604) 865-2304
Fax: (604) 865-3250

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Ground stability of a moderately dipping coal seam footwall.	10
2. Automated flocculation stations located on water courses draining out of the mine property.	3

Nancy Berzins, Senior Engineer, Mine Planning
Tel: (604) 865-3306

1. Interactive short and long term open pit computer mine planning system using micro-computers.	4 , 11
2. Enhancements to the production monitoring and control system (PMCS) for pit operations (units in shovels).	7 , 11
3. Use of classifying cyclones to improve the efficiencies of fines circuits and yields.	12
4. Raw coal ash analyzer to provide advance knowledge of feed quality and improved plant efficiency.	12
5. Improvements to truck washing facilities to reduce downtime currently associated with length of time required for steam units prior to conducting maintenance routines.	2 , 9
6. Bucket load weighing unit for hydraulic shovels.	2 , 5

Westmin Mines Limited,
Myra Falls Operations
P.O. Box 8000
CAMPBELL RIVER, BC,
V9W 5E2

P.R. Schultz
Asst. Manager/Chief Engineer,
Tel: (604) 287-9271
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
R. Van Dyk, Environmental Engineer Tel: (604) 287-9271	
1. Sub-aerial tailings deposition.	3 , 5
D. Botsford, Senior Mine Engineer Tel: (604) 287-9271	
1. The influence of rock mechanics considerations on mine design and short-and long-term stability.	4 , 10
2. Prevention of secondary sulphide dust ignitions/explosions.	9
3. Computer modelling of the H.W. Mine ventilation system.	9 , 11
4. Evaluation of ceramic exhaust filters on load haul dump (LHD) equipment.	1 , 9
5. Cementation of waste rock to effect control of acid mine drainage.	3

Central Canada Potash,
Noranda Minerals Inc.,
P.O. Box 1500
COLONSAY, SK,
S0K 0Z0

Dr. A.M. Coode
Chief Mine Engineer
Tel: (306) 944-2170
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. A field test program to evaluate the use of waste salt backfill in Saskatchewan potash mines.	10
2. A computer system to predict subsidence related to potash mining for use on IBM ATs.	10 , 11
3. Tri-axial creep test on sylvite occurring in a Saskatchewan potash mine.	10
4. Basic research into the control of brines around underground bulkheads in Saskatchewan potash mines.	10
5. Assessment of longevity of grouts used underground in Saskatchewan potash mines.	10
6. Solution mining for disposal of salt tailings. (D.L. Dacks, Plant Engineer; T. Pexeira, Sr. Process Engineer)	2 , 3

W.C.H. Kruining, Technical Services Supervisor
Tel: (306) 944-2170

1. Recirculation of exhaust air in potash mines.	9

Cigar Lake Mining Corporation
410-224 Fourth Avenue S.,
SASKATOON, SK,
S7K 5M5

John A. Nightingale
President
Tel: (306) 665-2628
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Underground testing of a mining method for a very high-grade uranium deposit.	4

Echo Bay Mines Ltd.
3300 Manulife Place,
10180 - 101 Street,
EDMONTON, AB,
T5J 3S4

W. Burton
Chief Mine Engineer
Tel: (403) 429-5811
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Longhole mining of narrow ore bodies with small, mechanized equipment.	4 , 7

Hudson Bay Mining and Smelting Co. Ltd.
Ruttan Division
P.O. Box 103,
LEAF RAPIDS, MB,
R0B 1W0

M. Kirby
General Manager,
Tel: (204) 473-2415
Fax:

PROJECT TITLE
TITRE DU PROJET

CATEGORY
CATÉGORIE

Andy Gottzmann, Chief Geologist
Tel: (204) 473-2415

1. Cable bolting: literature search, install grouted cable bolts in crown pillar, determine effectiveness, verify influence of blasting using finite element technique. 10

2. Develop the pre-and post-processor modules in a micro computer environment for the MINTAB and OFREEF programs. 10

Inco Limited
Manitoba Division
THOMPSON, MB,
R8N 1P3

W.R. Niemi
Supt. Mines Research,
Tel: (204) 677-5211
Fax:

	PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1.	Development of a geomechanical database and numerical model for predicting ground behaviour at depth. (CAN/MAN. MDA)	4 , 10
2.	Optimization of blast design for blasthole mining operations. (CAN/MAN. MDA)	4 , 7
3.	Evaluation of non-destructive testing devices for mine shaft ropes. (CAN/MAN. MDA).	5
4.	Vertical blasthole mining (VBM) design guidelines for steeply dipping ore bodies, hang-up removal and scaling techniques. (CAN/MAN. MDA)	4 , 10
5.	Development of a polyurethane tire for underground application. (CAN./MAN. MDA.)	5

International Minerals
and Chemical Corporation (Canada) Ltd.,
Potash Division,
ESTERHAZY, SK,
S0A 0X0

Jan Beno,
Manager, Metallurgy
& Development,
Tel: (306) 745-3931
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Study of overburden movement and pillar behaviour in extracted (mined-out) areas.	10
2. Seismic monitoring.	10
3. Pulse E.M. for identification of conductive anomalies near potash mine workings.	10

Potash Corporation of Saskatchewan,
Earth Sciences Mining Division,
PCS Tower,
Suite 500, 122 - 1st Avenue
SASKATOON, SK,
S7K 7G3

James L. Lewis
Mine Engineer,
Tel: (306) 933-8567
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Laser based rangefinder system.	9
2. Develop radio control system for continuous miner.	11
3. Develop radio control systems for bridge conveyors.	8
4. Full automation of continuous miner by intergration of ore grade analysis, artificial vision, ultra-sonic sensor, inclinometer and tram control systems.	11
5. Wear debris monitoring system for continuous miner.	5
6. Hoist rope lubricant friction tests.	9
7. Dust suppression using electrostatic mist equipment.	9
8. Non-destructive testing (NDT) system for concrete shaft linings in potash mines.	9
9. Conceptual design of development bridge conveyor in a potash mine.	5
10. Test and evaluate diamond enhanced bits on a continuous miner.	5
11. Potash mine clay seam sensing by thermographic imaging equipment.	10

Victor Ong, Rock Mechanics Engineer
Tel: (306) 933-8554

1. Development of 2D and 3D numerical modelling programs. 10

2. Tri-axial creep testing of potash ore from Saskatchewan mines. 10

Gordon Phillips, Senior Geological Engineer
Tel: (306) 933-8569

1. Development of micro-seismic monitoring systems. 9 , 10

2. Application of geotomographic imaging in potash mining. 9 , 10

3. Application of radar technology to in-seam geophysics in potash mining. 9 , 10

Terry Danyluk, Mine Geologist
Tel: (306) 933-8568

1. Development of 3-dimensional seismic reflection techniques to survey prospective ore panels. 3

2. Surface photo-lineament studies as an aid to identifying sub-surface geology. 3

Smoky River Coal Limited
P.O. Box 2000
GRANDE CACHE, AB,
T0E 0Y0

Horst H. Sandkuhler
Manager, Underground Mines
Tel: (403) 827-3711 Ext. 222
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Thick seam underground coal mining demonstration project.	2 , 4

Tantalum Mining Corporation
of Canada Limited
P.O. Box 2000
LAC DU BONNET, MB,
R0E 1A0

R.A. Simard
Mine Superintendent
Tel: (204) 345-8658
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Stress analysis resulting from pillar reduction in room and pillar mining; used to establish new pillar pattern.	7 , 10
2. Comparative button bit studies to determine the most appropriate $1\frac{3}{4}$ inch rock bit for spodumene ore.	5 , 7

Algoma Steel Corporation Ltd.,
Algoma Ore Division
George W. MacLeod Mine,
WAWA, ON,
P0S 1K0

A.L. Stevens
Mine Manager
Tel: (705) 856-4620
Fax: (705) 856-7006

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Computerized tracking of mine ores and grades.	4 , 11

Denison Mines Ltd.,
Elliot Lake Operations,
Box B-2600,
ELLIOT LAKE, ON,
P5A 2K2

Gaetan St.Denis,
Technical Services Engineer,
Tel: (705) 461-6285
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Continuing search for and development of low profile (6.5 feet) mining equipment. (25 seat mancarrier, load haul dump (LHD) unit).	5 , 6
2. Testing methods for mining, drying and conveying high grade fines recovered from sumps.	5 , 8
3. Use of consolidated fills for controlling violent pillar failures.	10
4. Evaluation of co-generation projects for production of steam and electrical power.	5
5. Development of a computerized surveying system for using AUTOCAD to update mine plans and store survey pickups.	1 , 11
6. Evaluation of remote control operation of multiple underground rockbreakers.	2
7. Use of microseismic instrumentation to monitor pillar stability.	10

Domtar Chemical Group
Sifto Salt Division
Goderich Mine
North Harbour Road
P.O. Box 370
GODERICH, ON,
N7A 4C6

D. Bray
Manager Maintenance,
Planning & Eng.
Tel: (519) 524-8351
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Mechanical scaling - development of a roadheader type machine to facilitate scaling the back (roof) and face of headings.	5

Neil Crocker, Mine Engineer
Tel: (519) 524-8351

1. Mine modelling incorporating gas pressure statistics obtained by computerized monitoring of the overlying mine strata.	10 , 11
2. Pillar shielding experiment to reduce scaling requirements.	10

Domtar Gypsum
3310 South Service Road
BURLINGTON, ON,
L7N 3M6

Ray Hartviksen
Manager Engineering
Tel: (416) 333-2212
Fax: (416) 333-2227

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Design and selection of cutter bit and bit spacing on the cutter head.	7 , 5

Falconbridge Ltd.,
ONAPING, ON,
P0M 2R0

John Vary, ing.,
Supt. Technical Services,
Tel: (705) 966-3411
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Improving productivities in cut-and-fill stopes through mechanized bolting and scaling.	5 , 7
2. Pillar recovery in blasthole stopes situated adjacent to consolidated hydraulic fills.	7
3. Improvement of fill placement techniques to reduce cement content, segregation and dilution during pillar recovery.	10
4. Use of paste fills and other high modulus fills, state-of-the-art studies in progress.	10 , 11
5. Microseismic monitoring systems; installed at all Falconbridge mines and linked to a central control room for continuous 24-hour monitoring.	10 , 11
6. Rockburst studies at Strathcona Mine jointly with CANMET and the Ontario Government with emphasis on fault slip behaviour.	10
7. Development of 2-D and 3-D numerical modelling programs using the Distinct Element Approach.	10 , 11
8. Blast vibration monitoring in blasthole stopes when mining against backfill.	10 , 9
9. Computer-aided design for optimum mine planning.	4 , 11
10. Trials with a mechanized scaling machine and a mechanized bolter/screener.	5

11. Establishing a central control room at Strathcona for hoists and other materials handling functions. 8 , 9

12. Blind boring raises with cluster drill heads. 5 , 6

13. Guidance systems for underground vehicles. 2

14. Measuring levels of materials in ore and waste passes using radio imaging technology. 8

15. Developing data bank and understanding of fault slip rockbursts using full seismic waverform analysis, 2 and 3D modelling and tomographic imaging. 4 , 10

16. Developing stability graph approach to design post pillar cut-and-full stopes. 4 , 10

Falconbridge Limited,
Kidd Creek Division
P.O. Box 2002
TIMMINS, ON,
P4N 7K1

Dr. Thiann R. Yu
Chief Engineer, R & D,
Tel: (705) 267-8787
Fax: (705) 267-8709

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Loose rock sensing system for mechanized scaling.	5 , 11
2. Pozzolanic property of Cu ground slag.	10
3. Improvement of underground radio communications.	1
4. Zeta potential control for enhanced drilling; to maximize bit penetration and prolong bit life.	7
5. Hang-up relief techniques for drawpoints and ore passes.	5
6. Oxidation of sulphide ore.	7 , 9
7. Installation of a mine-wide microseismic system.	5 , 10
8. Ground support for drifts passing through cemented rockfill.	10

Hemlo Gold Mines Inc,
Golden Giant Mine
P.O. Box 40
MARATHON, ON,
P0T 2E0

Bill Hrastovich
Rock Mechanics Engineer
Tel: (807) 238-1121
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Microseismic system installation and monitoring at Hemlo Gold Mines Inc.'s Golden Giant Mine.	10 , 11
2. Installation and operation of Local Area Network (LAN tastic), linking engineering, geology and peripheral (service) data acquisition and microseismic processing computer systems.	11

Inco Limited
Ontario Division
Copper Cliff, On,
P0M 1N0

R.C. Aelick
Manager Mines Research
Tel: (705) 682-5261
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Testing of "double-decked" crater blasting techniques.	7
2. Microseismic monitoring.	10 , 11
3. Development of a 3-D numerical modelling system for rock mechanics.	10 , 11
4. Jointly developing, with Spar Aerospace, remote controlled underground equipment to screen and bolt in recently blasted areas.	5 , 11
5. High density fill.	8 , 10
6. 70 ton electric automated haulage truck.	5
7. Development of equipment for underground shaft drilling.	5 , 6

Lac Minerals Limited,
Macassa Division,
P.O.Box 550,
KIRKLAND LAKE, ON,
P2N 3J7

E.N. Nelson,
Area Engineer,
Tel: (705) 567-5208
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Mine monitoring and control system for pumps, fans and heating system.	11 , 9
2. Tailings reclamation using dredging and dry excavation.	3 , 12
3. Installation of microseismic system to monitor rockbursts.	10 , 11
4. Testing feasibility of replacing posts in timbered drifts with cable slings.	10 , 2
5. Longhole mining in narrow veins.	7
6. Recovery of heat from waste mine water and compressors to preheat mine ventilation intake air.	9
7. Cemented rockfill.	10
8. Auxiliary ventilation with centrifugal fans.	9
9. Introduction of small capacity LHD equipment into narrow vein track mining operations.	5 , 8
10. Raise boring in highly stressed ground.	6 , 10
11. Construction and commissioning of new gold mill.	12
12. Design installation and commissioning of an effluent treatment plant for a 1250 ton-per-day gold mill.	3

Lac Minerals Ltd.,
Page-Williams Mine Division,
P.O. Bag 500
MARATHON, ON,
P0T 2E0

Stewart T. Brown, P.Eng
Chief Mine Engineer,
Tel: (807) 238-1100
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Upgrade and automate a surface cement slurry plant to facilitate one man control.	8
2. Install and commission u/g radio communications system.	1
3. Install and commission a high-pressure pumping system for the handling of underground slimes (from sumps and settlers).	9
4. Test trials of new underground bulk explosives handling vehicle.	5
5. Design, install and commission an underground bulk lubricants handling system.	8
6. Installation and commissioning of a gyratory crusher and screen plant for production of crushed rock backfill	8
7. Flyash substitution for cemented rock fill; 3% cement and 2% flyash to bind a minus 6 inch crushed rock backfill.	7
8. Design, install and commission an automatic monitoring system for major underground fixed equipment c/w centralized PLC control.	9
9. In situ stress monitoring program utilizing IRAD gauges to monitor changes in stress fields in secondary stopes as a result of ongoing primary mining.	10

Mattabi Mines Ltd.,
Lyon Lake Division,
P.O. Box 190
IGNACE, ON,
P0T 1T0

Manfred Lengwenus
Mine Superintendent
Tel: (807) 934-2291
Fax: (807) 934-2291

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Development of camera-linked receiver/transmitter systems for operating and retrieving remotely operated scoops (LHDs).	6 , 11

Noranda Minerals inc.,
Geco Division,
P.O. box 100,
MANITOUWADGE, ON,
P0T 2C0

B. Anderson
Chief Mine Engineer
Tel: (807) 826-3211
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Investigating the possibility of remote automation of production scram drift slushers.	8 , 11
2. Research on causes, effects and prevention of sulphide dust explosions.	1 , 9
3. Investigating the various methods of loading wet blastholes with non-water-resistant ANFO. (Kent MacNeill, Snr. Blasthole Tech.)	5 , 7
4. Investigate difference in ground disturbance caused by various blasting sequences, as measured by vibration monitor. (Kent MacNeill, Snr. Blasthole Tech.)	7 , 10
5. Investigation of the ways to move ANFO horizontally without using compressed air as a motive force. (Ken Culhane, Planning & Electrical Eng.).	7 , 8
6. Evaluation of cement alternatives, such as the use of slags in hydraulic backfill materials. (Michael Zaiser, Snr. Contract & Research Eng.)	8 , 10
7. Study ways and means to attenuate vibration exposure for drill doctors and drill sharpening personnel. (Michael Zaiser, Snr. Contract & Research Eng.)	1 , 5
8. Development of blasthole lay-out pattern software such as AUTOLISP and AUTOCAD programs. (L. Kneen & W. Harris - Survey/Blasting group.)	7 , 9
9. Development of engineering controls for environmental noise attenuation and personal hearing protection. (Lester Kneen, Chief surveyor).	1 , 5

10. Development of an electronic survey notebook that can be coupled to a computer to prepare mine survey results and implement plotting. (Lester Kneen, Chief Surveyor). 9 , 11

11. Development of computer programs to monitor exposure of workers to various specified environmental toxic pollutants. (Monica Kuntzel, Bonus & Research Tech.) 1 , 9

12. Control of underground ventilation fans using a surface located personal computer system. (B. Horochuk & P. Beaulieu, Plan. & elect. Eng.). 9 , 11

13. Investigation of blasting system using light generated energy to initiate blast - Photodet system. (Kent MacNeill - Snr. Blast. Tech.) 7 , 11

14. Phasing-in automation of mine production scram drift operation. (Douglas Sands, Spvr. Eng. Services) 7 , 11

15. Ground control, closure phenomena - station monitoring. 10

William Harris, Blasthole Technician
Tel: (807) 826-3211

1. Development of slot raises using single, large diameter longholes. 4 , 7

2. Blasting technology software program for use with blasthole stoping. 7 , 11

3. Developing a blasthole stoping system using 170 ft. vertical lifts without intermediate levels. 4 , 7

Kent MacNeil, Senior Blasthole Technician
Tel: (807) 826-3211

1. Photo-Det blast initiation using light-generated energy. Field testing and development of additional hardware. 7 , 11

Denis Blier, Senior Research Contracts Analyst
Tel: (807) 826-3211

1. Evaluation and trials of solid rubber tires for u/g trackless equipment. 5 , 7

2. Shortcrete research - dry process shotcreting for ground support and airflow improvement purposes. 5 , 10

Placer Dome Inc.,
Campbell Mine,
P.O. Box 10,
BALMERTOWN, ON,
P0V 1C0

Gordon Reid
Chief Engineer
Tel: (807) 735-2075
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Investigation of microseismic data to determine the mechanics of rockbursts at Campbell Mine and to refine computer model.	10 , 11
2. To develop a microcomputer-based survey system.	9
3. Implementation of mine-wide underground radio communication system.	1 , 5
4. Evaluation of backfill as support in rockburst-prone areas by installing and monitoring suitable instrumentation.	10
5. Design of longhole mining methods for use in highly stressed and rockburst-prone crown pillars.	10 , 4

Placer Dome Inc.,
Detour Lake Mine,
130, Wilson Ave.,
TIMMINS, ON,
P4N 2S9

John Mahon
Human Resources Supt.,
Tel: (705) 245 3211
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
T. Doyle, Mine Maintenance Superintendent Tel: (705) 245-3211	
1. Mine radio system - leaky feeder technology.	1 , 11
2. Hoisting - skipping automation.	8
3. Backfill automation.	5 , 10
4. Energy monitoring system - load shedding.	9
Jack MacRory, Chief Engineer Tel: (705) 245-3211	
1. Large-scale mechanized cut-and-fill stoping.	7 , 8
2. Narrow vein longhole stoping with remote mucking.	7 , 8
3. The use of large diameter culverts for vehicle access through backfill.	6 , 8
4. A push-pull ventilation system utilizing centrifugal fans.	9
5. On-site assay lab for daily grade control of gold ore.	9
6. Automated surface to underground fuel delivery system.	9
7. The use of consolidated alluvial sand for sill pillar removal.	10

Gord Trimble, Chief Geologist
Tel: (705) 245-3211

1. Computerization of cross-sectional block ore reserves using Geostat International Sectcad software and DBase III software for the drill hole and mine opening database. 2 , 11

2. Underground geological grade control using chip and grab samples from every ore blast with quick assay turnaround to control mining dilution of subsequent blasts. 7 , 8

Placer Dome Inc.,
Dome Mine,
Box 70,
SOUTH PORCUPINE, ON,
P0N 1H0

Ross Hill,
Special Projects Engineer
Tel: (705) 235-3221
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Development and verification of computerized cut-and-fill panel design.	4 , 10
2. Feasibility study for rehabilitation of Paymaster orebody.	2
3. Computerization of ventilation surveys.	1 , 9
4. Refinement of placement techniques for paste fills.	8, 10

Renabie Gold Mines Ltd.
P.O. Box 65
MISSANABIE, ON,
P0M 2H0

Gordon Reed
Chief Mine Engineer
Tel: (705) 234-2333
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Sub-level caving below the 3510 level.	4
2. Sub-level open stoping being introduced on 3930 level.	4
3. Design and develop decline from 3930 level to access for Western Ore body.	4
4. Design and develop decline to provide shaft spillage mucking facility.	4
5. Design and develop truck haulage and ore pass systems on 4105 level.	4 , 8

Rio Algom Limited
Elliot Lake Operations
P.O. Box 1500
ELLIOT LAKE, ON,
P5A 2K1

S.N. Muppalaneni
Supt. Mining Services
Tel: (705) 461-4325
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Evaluation of computerized survey calculations.	9 , 11
2. Underground radio communications.	1 , 11
3. Trials and evaluation of fracturing and in situ bacterial leaching of sub marginal uranium ore; ie. not in ore reserves.	2 , 7

Cambior Inc.
Division Siège social
1075, 3ième avenue est
VAL D'OR, PQ,
J9P 6M1

Richard Leclerc
Directeur, Ingénierie minière
Tel: (819) 824-3563
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Design of a control system to accommodate flexible costs and permit steady operational progress.	1
2. Design of guidelines or manual for the primary evaluation of exploration properties or mine sites.	2

Cambior Inc.
Mine Pierre Beauchemin
1075, 3ième avenue est
VAL D'OR, PQ,
J9P 6N1

Robert Marchand
Chef ingénieur
Tel: (819) 825-0211
Fax: (819) 825-0342

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Computer aided design to optimize mine planning operations.	11
2. Development of mining methods suitable for an ore body of intermediate dip.	7

JM Asbestos Inc.,
C.P. 1500
ASBESTOS, PQ,
J1T 3N2

Denis N. Roy
Ingénieur-en-chef
des opérations
Tel: (819) 879-5432
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Rock bolting open pit walls.	10
2. Remote control of primary crusher operation.	11 , 12
3. Measurement of vertical movement on a bench by hydrostatic levelling equipment.	4 , 10
4. Remote surveillance of mine plant entrances.	1 , 9
5. Programmable controller for packaging operation.	12
6. Statistical study of quality control.	12
7. Computerization of mine planning and design.	4 , 11
8. Automation of inclinometer readings and records.	10 , 11
9. Surveying the ground water conditions in and around an ore body.	3
10. Studying the feasibility of establishing an impervious barrier to prevent water inflow in mines.	2 , 10
11. Design of inclinometers that are highly resistant to deformation in situ operating conditions.	10
12. Programmable controllers for use with shuttle conveyor systems.	12
13. Strategic evaluation of the options available for managing asbestos tailings.	8 , 3

LAB Chrysotile inc.
835, rue Mooney
C.P. 459
THETFORD-MINES, PQ,
G6G 5T5

Gaston Verreault
Vice-président
Tel: (418) 338-7500
Fax: (613) 995-3456

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
Pierre Laroche, Directeur, contrôle de la qualité Tel: (418) 338-7500	
1. Development of alternative grading categories for chrysotile asbestos.	1 , 12
2. Automation of asbestos fibre quality control in the mill.	12
Luc Michel, Directeur, services auxiliaires Tel: (418) 338-7500	
1. Strategic evaluation study of management options for asbestos tailings.	3 , 8
Robert Gale, Directeur, ingénierie d'usinage Tel: (418) 338-7500	
1. Studying the robotisation of bagging asbestos fibres.	11 , 12
2. Studying methods to reduce cost of energy required for drying asbestos fibres.	12
3. Studying the recovery of the fine fraction of asbestos tailings.	12
4. Studying the automation of bailing asbestos packages.	12 , 11

Les Explorations Muscocho Ltée,
Mine Montauban
C.P. 10
NOTRE-DAME de MONTAUBAN, PQ,
G0X 1W0

Marc Joncas
Directeur
Tel: (418) 336-2777
Fax:

PROJECT TITLE
TITRE DU PROJET

CATEGORY
CATÉGORIE

Pierre Delisle, Ingénieur de projets
Tel: (418) 336-2777

1. Determining the dimensions of pillars and stopes; recovering pillars; evaluation of pillar stability by numerical modelling. 4 , 10

Les Mines Selbaie,
C.P. 370,
JOUTEL, PQ,
J0Y 1N0

Denis Caron
Ingénieur-en-chef
Tel: (819) 756-2491 poste 232
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Optimization of blasting operations in open pit mining.	3
2. Surface crown pillar recovery by controlled caving of overburden.	7 , 10

Jean-Jacques Bouillon, Géologue en chef
Tel: (819) 756-2491

1. Characterization and structural study of an underground complex ore body (Zone A-2-1).	4

Luc Duval, Surintendant concentrateur
Tel:

1. Detailed study of crushing and grinding and the establishment of suitable parameters. Study in conjunction with McGill University and industry participants.	12
2. El potential use in Cu/Zn separation.	11 , 12
3. Use of expert systems in the management of tailings pulp density.	3 , 12
4. Use of column flotation to upgrade final concentrates.	12

Gérard Begin, Planificateur en chef
Tel: (819) 756-2491

1. Design and implementation of a computerized preventative maintenance program. 5 , 11

Les Mines Sigma (Québec) Ltée.,
300, 3ième avenue est
VAL D'OR, PQ,
J9P 4N8

Christian Pichette, ing.,
Ingénieur-en-chef,
Tel: (819) 825-4182
Fax: (819) 825-8476

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Construction of electro-hydraulic long-hole mini-drill. (Project in conjunction with CRIQ)	5
2. Experimental use of steel arches and pre-fabricated steel chutes in cut-and-fill mining operations.	7 , 10
3. Developing mining sequences for ore reserves located in a part of the mine subject to rockburst.	4
4. Computerization of survey calculations and bonus system.	9

Les Ressources Camchib Ltée.,
C.P. 3400,
CHIBOUGAMAU, PQ,
G8P 2K9

W. Zuckerkandel,
Directeur adjoint,
Tel: (418) 748-2625
Fax: (418) 746-6342

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Shaft deepening at Cedar Bay Mine (1455 feet) and installation of a new hoist room.	6 , 9

Les Services TMG (NIOBEC) Inc.,
Chicoutimi Mine,
3400, chemin du Columbium
C.P. 70,
ST-HONORÉ, PQ,
G0V 1L0

Michel Robinson
Directeur
Tel: (418) 673-4694
Fax: (418) 673-3179

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Biological treatment of recycled water.	3 , 12

Minerais LAC Limitée,
Division Bousquet,
C.P. 1180,
MALARTIC, PQ,
J0Y 1Z0

Luc Pacquette
Surintendant sous-terre,
Tel: (819) 759-3631
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Testing a new pattern for installing cemented cable bolts (parallel or mandolin cable bolting pattern).	10

Minéraux Noranda Inc.,
Division Matagami,
MATAGAMI, PQ,
J0Y 2A0

Jacques Gagné
Surintendant des mines
Tel: (819) 739-2511
Fax:

	PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1.	Automation of hydraulic backfill operations at the Isle Dieu Mine.	8 , 11
2.	Monitoring rock conditions using microseismic equipment such as extensometers and pressure cells.	10 , 11
3.	Monitoring and programming operation of surface and underground ventilation fans.	9 , 11
4.	Conversion of diesel-powered ST-5 LHD equipment to electric-powered operation.	5 , 8
5.	Automation of front-end loader equipment load-haul-dump cycle.	5 , 8
6.	Monitoring air quality with various gas detection devices.	9
7.	Transmission of video camera images by microwave and the programming of these cameras by telephone communications.	1
8.	Raise mining using long hole methods. (Uphole methods)	6

Minnova Inc.,
Division Lac Dufault,
C.P. 2000
NORANDA, PQ,
J9X 5B4

Richard Sanson
Ingénieur-en-chef,
Tel: (819) 797-2501
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Implementation of a rock mechanics program to determine the method of mining an ore body located at great depth.	10
2. Computerization of mine planning and design tasks such as design, surveying, blasting, ventilation and production statistics.	9 , 11
3. Computerization of bonus system.	9 , 11
4. Research focussed on the phenomena of soft inclusions in host rocks.	10
5. Studying the potential for rockbursts in deep mines.	10
6. Implementation of a rock mechanics program as an aid to determining stope dimensions in deep-seated ore bodies.	10 , 7

Minnova inc.
Division Lac Short
C.P. 539
CHAPAIS, PQ,
G0W 1H0

Laval Gilbert
Ingénieur-en-chef,
Tel: (819) 753-2571
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Implementation of a software system integrating geology, surveying, mine planning and production parameters.	7 , 11
2. Design and construction of a treatment plant for used mill/mine water.	3
3. Comparison of mining by long holes and the Avoca method.	7

Minnova Inc.
Division Opémiska
C.P. 10
CHAPAIS, PQ,
G0W 1H0

Jean-Marie Couture
Surintendant général,
Tel: (418) 745-2501
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Feasibility and use of remote-controlled CAVO 310 and 320 loaders.	5 , 11
2. Statistical study of the distribution of mineral samples (Au) in draw points.	3 , 8
3. Monitoring particle velocity (vibration) during the mining of surface crown pillar stopes using 6.5 in diameter long holes.	3 , 7
4. Work related health and safety.	1
5. Vibration studies (Jackleg drills).	5 , 7

Placer Dome Inc.,
Mine Kiena,
C.P. 9000,
VAL D'OR, PQ,
J9P 6A5

Jean Chamberland,
Ingénieur en chef,
Tel: (819) 738-4031
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Communication systems for underground workers.	1
2. Simulation of ventilation networks on micro-computers.	9 , 11
3. Computerized surveying system using CAD system to update mine plan.	9 , 11
4. Programmable controller for peak control	9 , 11
5. Software aided mine design - mine planning.	9 , 11

QIT-Fer et Titane Inc.,
Mine Tio,
C.P. 160
HAVRE ST-PIERRE, PQ,
G0G 1P0

René Scherrer
Ingénieur minier junior
Tel: (418) 538-2400
Fax: (418) 538-2983

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Installation and calibration of two mineral analysis devices.	5 , 11
2. Installation of piezometers to monitor the water table levels in relation to final pit walls/slopes.	3 , 10
3. Design of inventory software programs.	4 , 11
4. Design of software programs facilitating the use of basic mine information (surveys and drill logs) directly on PC-Mine and AUTOCAD hardware.	4 , 11
5. Computerization of aerial photography program results and mine plans using AUTOCAD-II software, in order to facilitate projects 3 & 4 above.	4, 11

Brunswick Mining and
Smelting Corporation Ltd.
Mining Division
P.O. Box 3000
BATURST, NB,
E2A 3Z8

Robert B. Fisher
Senior Planning Supervisor
Tel: (506) 546-6671
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Reducing the frequency of sulphide dust explosions by improved blasting practices.	11
2. Bulk emulsion explosive test. (G. Crowther)	7
3. Open stope fragmention study. (G. Crowther)	7
4. 3D mine geology modelling. (J. Smith)	11
5. Electronic surveying. (J. Smith)	11
6. Blasthole drilling layout by computer. (J. Smith)	11
7. Continuous loading with an Algo loader. (J. MacDonald)	7 , 8
8. Implementation of automatic controlled fans and regulators. (D. Patrie)	9

Tim Schnarr, Mine Manager
Tel: (506) 546-6671

1. 'Managing for Consistency' courses as part of a continuous management improvement strategy.	1
2. Introduction of the 'Demmings Philosophy' to mining applications.	1

Denison-Potacan Potash Company
P.O. Box 5005
SUSSEX, NB,
E0E 1P0

D.C.E. Waugh
Superintendent of Engineering
Tel: (506) 839-2146
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Use of backfill in potash mining (modelling).	10 , 11
2. Use of backfill in potash mining (laboratory and in-situ testing).	10
3. Microseismic monitoring project for potash mining operations in Saskatchewan at the DPPC mine.	10 , 11

Heath Steele Mines
A division of Brunswick
Mining & Smelting Corp. Ltd.
P.O. Box 400
NEWCASTLE, NB,
E1V 3M5

J. Martin
Mine Manager
Tel: (506) 622-2100
Fax: (506) 622-6576

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Heath Steele Waste Rock Study - three phases.	2 , 6

Potash Corporation of America, Inc.,
N.B. Potash Operations,
P.O. Box 1489,
SUSSEX, NB,
E0E 1P0

Brian Roulston,
Geologist,
Tel: (506) 433-5445
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Development and implementation of an integrated rock mechanics program for cut-and-fill potash mining.	7 , 10
2. Monitoring of consolidation in waste salt backfill.	10 , 11
3. Investigate the geotechnical feasibility of developing an injection well in the Moncton sub-basin for disposal of excess brine from the potash milling operation.	3
4. The study and predictive modelling of subsidence induced by potash mining.	10 , 3

University of British Columbia,
Dept. Mining and Mineral
Process Engineering,
6350, Stores Road,
VANCOUVER, BC,
V6T 1W5

A.L. Mular
Professor and Head, MMPE,
Tel: (604) 228-3983
Fax: (604) 228-5599

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Computer program for estimating capital and operating costs, and update of CIM Special Volume.	2 , 11

Dr. A.E. Hall, Mining Professor.
Tel: (604) 228-6294

1. Recirculation of mine ventilation air in order to decrease heating costs and increase face velocities.	9
2. Examination of sulphide dust explosions in Canadian mines.	1 , 9
3. Development of a file of mine service planning computer models that are compatible with the IBM-PC.	4 , 11
4. Development of PNET program for project scheduling.	1 , 4
5. Mine ventilation network analysis using spread sheet programs.	9

Dr. Alastair J. Sinclair, Professor & Head Geological Sciences
Tel: (604) 228-3763

1. Co-kriging as an aid to reserve estimation of precious metals.	2
2. Ore deposit modelling of polymetallic veins, Owen Lake, B.C.	2

C. Brawner, Professor - MMPE
Tel: (604) 228-3986

1. Pillar strengthening with grouted, untensioned rebar or rockbolts. 10

R. Pakalnis, MMPE
Tel: (604) 228-3988

1. Development of a fibrel/glass/polymer cable bolt. 10

2. Mine design within a post-yield environment. 10

University of Alberta
Department of Mining,
Metallurgical and Petroleum Engineering
606 Chemical-Mineral Building
EDMONTON, AB,
T6G 2G6

Dr. Ken Barron
Professor of Mining
Tel: (403) 432-3810
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Design criteria for pillars in coal mines.	4 , 10
2. Size effects on the triaxial strength of coal.	10
3. Cutter roof failure in coal mines - investigation of theoretical conditions, modelling results and comparison with case histories.	4 , 10
4. Design of artificial supports for footwall bedded slopes with particular attention to counteracting the "buckling" failure mode.	4 , 10
5. Voussoir beam analysis and its application to roof design for stratified deposits.	4 , 10

University of Manitoba
Department of Geological Engineering
314 Engineering Building
WINNIPEG, ON,
R3T 2N2

Brian Stimpson
Professor and Head of Dept.,
Tel: (204) 474-8596
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Stability and rock bolting of layered strata.	10
2. Mining induced fracture - potash mining.	10

University of Saskatchewan
Department of Geological Sciences
SASKATOON, SK,
S7N 0W0

Dr. D.J. Gendzwill
Professor of Geophysics,
Tel: (306) 966-5693
Fax: (306) 966-8593

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
1. Natural and induced seismicity in Saskatchewan.	10
2. Three dimensional (3-D) seismic reflection surveys from surface for use in potash mine planning exercises.	10
3. Electromagnetic sounding system for strata control in potash mines.	10
4. Seismicity and geophysical engineering in potash mines.	3 , 10
5. Consideration of the glacial and/or regional thrust structures when designing highway cuttings in Saskatchewan.	10
6. Study of faults and jointing in relationship to open pit coal mining operations in southern Saskatchewan.	10

Dr. Malcolm Reeves, Professor, Geological Engineering
Tel: (306) 966-5703

1. Investigation of the permeability structure of potash tailings piles.	3
2. Compilation of a database of physical properties of salt, potash and associated rock types.	11
3. Discrimination between potash ores using remotely-sensed images in the visible spectrum.	11

4. Evaluating the potential of the Deadwood-Winnipeg and Interlake Formations for the disposal of postash brines. 3

Dr. D. Stead, Assistant Professor,
Tel: (306) 966-5714

1. Study of fracture mechanisms in rocks using ultrasonics, electron microscopy and mathematical modelling techniques. 10

2. A physical properties database for the potash industry. 10

3. Borehole acoustic logging around underground potash mine openings. 10

4. Slope stability studies in Southern Saskatchewan. 10 , 3

5. The factors affecting slope stability in surface coal mines. 10 , 3

Lakehead University
Dept. of Mechanical Engineering
955 Oliver Road
THUNDER BAY, ON,
P7B 5E1

Dr. J.G. Locker
Director,
Tel: (807) 343-8321
Fax:

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
Dr. Inder Nirdosh, Professor Tel: (807) 343-8343	
1. Processes for obtaining environmentally safe uranium mill tailings.	3 , 12
Dennis Roddy, Professor, Electrical Engineering Tel: (807) 343-8437	
1. Analysis and interpretation of sub-surface radar signals.	11
Henry North, Professor, Mechanical Engineering Tel: (807) 343-8560	
1. Low frequency cavitation processing.	11
2. Resonance grinding.	11
3. Sonic drill - Use of high-frequency, mechanical oscillation to achieve faster drilling rates.	3 , 7

Dr. H.T. Saliba, Associate Professor
Tel: (807) 345-212

1. Development of software modelling program and construction of physical laboratory scale model to investigate and analyse vibration in mine hoisting systems. 9

Laurentian University,
Centre for Mining and Mineral
Exploration Research (CIMMER),
Ramsey Lake Road,
SUDBURY, ON,
P3E 2C6

Dr. G. Courtin,
Director CIMMER
Tel: (705) 675-1151
Fax: (705) 673-6532

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
Dr. M.A. Persinger, Professor, Tel: (705) 675-1151, x4252	
1. Monitoring and analysis of seismic events in the Sudbury Basin for use in correlating rockburst phemonena with mining operations and prediction of risk of rockbursts.	10
2. Using luminous phenomena to predict tectonic strain regions in North America; determination of relationship between forced fluid injection and patterns of strain release.	10
Dr. F.W. Clulow, Research Specialist Tel: (705) 675-1151. x2275	
1. Radionuclides in mammals living in drainage systems associated with uranium mine tailings.	3
2. Radionuclides transferred from mothers to offspring.	3
Drs. G. Rubin & M. Leach, Dept. of Physics Tel: (705) 675-1151, ext 2286	
1. Hard rock fragmentation using sonic and ultrasonic resonances.	11
2. Acoustic emission spectral analysis and the study of its application in ground control technology.	10 , 11

Dr. K. Westaway, Chemistry Professor
Tel: (705) 675-1151. x2105

1. The lifetimes and pathways of the PAHs and mutagens in dieselized underground mines. (Dr. D. Hallman, assoc. researcher.) 1

2. Determination of the nitro PAHs and mutagens generated by the catalytic converters used on underground diesel equipment. 1

Dr. Keith Winterhalder, Associate Professor, Dept. of Biology
Tel: (705) 675-1151, ext 2286.

1. Monitoring of nitrogen status and nitrogen fixing capacity of soils rendered barren by industrial activity and/or revegetated for reclamation purposes. 3

Dr. Lloyd.D. Reed, Professor of Physics
Tel: (705) 675-1151. ext. 3205

1. Investigation of light-charged particles emitted by rocks during fracture. 10 , 2

Dr. D.E. Goldsack, Dean of Sciences & Engineering
Tel: (705) 675-1151

1. Chemo-abrasive water jet cutting of rocks. 5 , 11

2. Studies on densified backfill. 10

Dr. Michael L. Jeremic, Professor
Tel: (705) 675-1151 ext.2250

1. Ground de-stressing by camouflet blasting. 10

2. Stability analysis of rocksalt mines - conventional underground and solution mining. 10

Dr. Laxman M. Amaratunga, Professor
Tel: (705) 675-1151

1. Study of sulphide dust explosions in Canadian mines - a fine particle approach. 1 , 9

2. Agglomeration of fine mill tailings for backfill. 12 , 10

3. Fine mill tailings for underground backfill as a supplementary fill material. 10 , 12

Dr. A. Farah, Professor
Tel: (705) 675-1151

1. Resin/cement grouted bolts in underground mining. 4 , 10

2. Studies on densified backfill material. 10

Dr. S.P. Singh, Associate Professor
Tel: (705) 675-1151 x2247

1. Guidelines to controlled blasting underground using small diameter blast holes. 7 , 10

2. Cuttability and abrasiveness of hard rocks. 10

Dr. Shailendra K. Sharan, Professor
Tel: (705) 675-1151 ext. 2246

1. Development of finite element techniques for analyzing underground openings. 10 , 11

2. Numerical modelling of blasting and rockursts for mine design. 10 , 11

Laurentian University,
Geomechanics Research Centre,
Ramsey Lake Road
SUDBURY, ON,
P3E 2C6

Peter K. Kaiser
Professor/Director
Tel: (705) 673-6517
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Numerical modelling of ground response to excavation.	10
2. In situ stress measurement data analysis for nuclear waste repository.	10
3. Hard-rock tunnel boring machine evaluation.	4 , 5
4. Fault slip rockburst study.	10
5. Microseismic source location evaluation.	10
6. Hard rock support design.	10
7. Cable bolt performance monitoring.	10

Queen's University
Department of Mining Engineering
Goodwin Hall
KINGSTON, ON,
K7L 3N6

Peter Calder
Head of Department
Tel: (613) 545-2196
Fax: (613) 545-6597

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Pit slope stability studies.	4 , 10
2. Control blasting.	7 , 10
3. Open pit simulation studies.	2 , 4
4. Microseismic emissions related to rock failure.	10
5. Computerized open pit feasibility and design.	2 , 4

James F. Archibald, Associate Professor
Tel: (613) 545-2198

1. Development of microseismic monitoring networks for rockburst precursor detection and rapid in situ stress assessment.	10
2. Long term subsidence prediction in potash extraction operations based on field monitoring, laboratory measurements and computer modelling.	4 , 10
3. Assessment of quality control parameters influencing in situ backfill competence.	4 , 10
4. Use of chemical gelling agents as cement replacement materials in backfills.	4 , 10
5. Use of total tailings for backfill support.	2 , 4

John G. Paterson, Professor
Tel: (613) 545-2207

1. Activated carbon losses in carbon in pulp circuits. 12

2. Treatment of refractory arsenic gold ores by pressure chlorination. 12

W.F. Bawden, Chair & Professor, Mine design
Tel: (613) 545-6553

1. Development of a design method for the support of underground mining excavations in hard rock. 10 , 11

2. A study to evaluate the use of Campbell Red Lake Mine microseismic data in mine design. 10 , 11

3. Evaluation of the application of Mathews Empirical Stope Design technique to Falconbridge post pillar cut-and-fill mining. 10

Garston Blackwell, Associate Professor
Tel: (613) 545-2204

1. Open pit mine design and production scheduling using microcomputers and CAD systems. 4 , 11

2. Underground stope layout and mine design using microcomputers and CAD systems. 4 , 11

3. Automating surface and underground routine mine survey by interfacing with computer aided design and drafting systems on microcomputers. 9

4. Research on and installation of automatic survey slope monitoring systems using radio telemetry. 10

5. Photogrammetric analysis of pit slope and mine design and slope stability investigations using CAD systems on microcomputers. 10

6. Reconciliation of grade control and production statistics with geostatistically defined ore reserves and mineral inventories. 3 , 4

7. Application of CAD systems and computer data bases to geological mapping and grade control in underground mines. 10 , 9

8. Computerized underground mine surveying with CAD. 6 , 9

9. Open pit mine surveying, planning and economic analysis. 2 , 3

10. Remote automatic real time survey slope monitoring systems using radio telemetry. 10 , 3

W.T. Yen, Associate Professor
Tel: (613) 545-2206

1. Carbon stripping at ambient temperature and carbon stripping with non-cyanide solution. 11 , 12

2. Pressure oxidation of refractory gold ore followed by thiourea leaching. 11 , 12

3. Pressure oxidation of refractory gold ore with sodium hypochlorite. 11 , 12

4. Carbon and gold loss in the carbon-in-pulp and carbon-in-leach processes. 12

Euler De Souza, Assistant Professor
Tel: (613) 545-2199

1. Evaluation of in-the-hole (ITH) dry drilling technology. 7 , 5

2. Quantitative vibration evaluation of rock drill handles.	1 , 5
3. A model to predict toxic fumes from explosives and dilution ventilation.	1 , 9
4. Development of an automatic data acquisition system to monitor rock deformation.	10 , 11
5. Modelling and instrumentation of mine openings in stabilized backfill.	10 , 11
6. Geotechnical study of the Galmoy Project (Conroy Petroleum and Natural Resources), Ireland.	10

Dr. P. Katsabanis, Professor
Tel: (613) 545-2196

1. Explosive foam initiation modelling.	7
2. Development of a detonation calorimeter.	7
3. Determination of accuracy of NONEL detonators.	7
4. Sulphide dust explosion.	7
5. Modelling of non ideal explosives.	7

University of Waterloo
Department of Earth Sciences
WATERLOO, ON,
N2L 3G1

Dr. Maurice B. Dusseault
Chairman, Geological
Engineering
Tel: (519) 888-4590
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Development of an expert system for geophysical log interpretation.	6 , 11
2. Waste management for oil sands mines.	3
3. Properties of geomaterials.	3
4. Sand production in oil wells.	7
5. Use of Halite Process wastes as backfill in potash mines.	10
6. Potash mine design (software)	4
7. Hydraulic fracture in sands and sandstones.	6

Dr. John A. Franklin, Research Professor
Tel: (519) 885-1211 ext. 2624

1. Development of expert systems for rock mass classification and design of underground openings.	10 , 6

Dr. John A. Cherry,
Tel: (519) 885-1211

1. Hydrogeochemical investigations of the INCO mine tailings area, Sudbury, Ontario.	3

Dr. R.W. Gillham,
Tel: (519) 885-1211

1. Development of a laboratory procedure for evaluating the effectiveness of reactive tailings covers. 3

Dr. Ronald V. Nicholson
Tel: (519) 885-1211 or 6999

1. Reduction of acid generation in mine tailings through the use of moisture retaining cover layers as oxygen barriers. 3

2. A laboratory investigation of the kinetic controls on copper and zinc concentrations in sulphide tailings. 3

Collège de la région de l'amiante
Centre spécialisé en technologie minérale,
671, boul. Smith S.
THETFORD-MINES, PQ,
G6G 1N1

Réjean Nadeau
Directeur
Tel: (418) 338-8591
Fax: (418) 338-3498

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Mechanization of mine dump revegetation programs using filter muds/slurries.	4 , 5
2. Automation of quality control procedures for asbestos fibre using the SPC method.	11 , 12
3. Pre-impregnate with asbestos fibre base.	6
4. Study of fertilisers for revegetation projects.	6 , 12

École Polytechnique
Centre canadien d'automatisation
et de robotique minières (CCARM)
C.P. 6079, succ. A
MONTRÉAL, PQ,
H3C 3A7

Dr. André Piché
Directeur général, CCARM
Tel: (514) 340-4049
Fax: (514) 340-4440

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Evaluation of a short-haul guidance system for underground haulage trucks.	5 , 11
2. Study of the development of data communications systems for use underground.	1 , 11
3. Automation of rock breaking by vision feed-back.	11 , 5

École Polytechnique,
Département de génie minéral,
C.P. 6079, succ. A,
Montréal, PQ,
H3C 3A7

Denis E. Gill
Professeur titulaire
Tel: (514) 340-4865
Fax: (514) 340-4440

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Geostatistical characterisation of rocks in the rock mass.	10
2. Historical effects of loading with the convergence-confinement method.	10
3. Indentation tests on the side walls of boreholes.	10
4. Analysis of stability of surface crown pillars.	10
5. Effect of the redistribution of stress around underground mine openings in rock salt strata.	10
6. Mechanical behaviour of salt fines under weak confining stresses.	4 , 10
7. Effect of the rigidity of rock mass on shear resistance caused by geological discontinuities.	10

M. Aubertin, Professeur adjoint
Tel: (514) 340-4046

1. Evaluation of the potential for rockbursts in mines.	10
2. Investigation of post-rupture behaviour of rocks and brittle materials.	10
3. Development of constitutive models for rock salt.	10

4. Extension of a unified viscoplastic model to determine behaviour of ductile and semi-brittle materials (rocks, minerals). 10

5. Effects of mechanical damage on the behaviour of crystalline minerals. 10

6. Geotechnical design of impervious barriers in mine tailings that generate acid waters. 3

7. Environmental aspects of using backfill in mines. 3

8. Anisotropic effects of the shear resistance of clays on measurements by in situ shear testing. 3

Robert P. Chapuis, Chercheur
Tel: (514) 340-4427

1. Hydraulic-mechanical interaction during in situ permeability tests. 3 , 11

2. Development of data concerning the hydraulic properties of road aggregates. 3

3. Influence of drill water on ground permeability measurement. 3 , 5

4. Determining the significance of permeability data obtained during pumping tests. 3 , 10

5. Impervious properties of soil-bentonite mixtures (water retention by tailings). 3

6. Anisotropy of shear resistant clays on in situ measurement by shear testing. 3

7. Hydrogeological mapping of water-bearing risk zones. 3 , 11

J. Elbrond, Professeur
Tel: (514) 340-4865

1. Modelling (simulation) of the productivity of single mining machines, man-machine synergism and machine systems. 1

2. Loss of mineral values and dilution by barren material. 7

3. Optimization of open pit mining limits (final pit walls). 4

4. Final underground mining limits; optimization of underground operations. 4

5. Comparative study of jackleg drills. 1

6. Cut-off grades. 2 , 3

7. Copper and the world market. 2

François Soumis,
Tel: (514) 340-4515

1. Computerized assignement (dispatch) of haulage trucks in open pit mines. 8 , 11

R. Corthesy, Professeur adjoint
Tel: (514) 340-4555

1. The effects of heterogeneity on the measurement of stress in rocks and concretes. 10

2. Evaluation of the redistribution of stress by measurement of residual deformation. 10

3. Measurement and control of deep-seated borehole temperatures using the 'Doorstopper' technology. 5 , 10

4. Modelling stress in nonlinear elastic materials and anisotropes. 10

McGill University
Department of Mining and
Metallurgical Engineering
McConnell Engineering Building
3480 University Street
MONTRÉAL, PQ,
H3A 2A7

Dr. Malcolm J. Scoble
Director, Mining Program
Tel: (514) 398-4374
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Mine backfill design and performance.	10
2. Monitoring machine breakage of rock.	5 , 11
3. De-stress blasting design.	10
4. Tunnel probe drilling for poor quality ground.	10
5. Expert system development for mine design/control.	4 , 11
6. The mechanics of digging/mucking in fragmented rock.	5 , 7

Dr. F.P. Hassani, Associate Professor
Tel: (514) 398-4377

1. Rock-support interaction studies.	10
2. Development of new pack material for coal mines.	10
3. Acoustic emission technology applied to mining.	10 , 11
4. Stability of gate roadways in underground coal mines.	4 , 10
5. Paste backfill characteristics.	10
6. Design techniques for steel support in mine tunnels.	4 , 5
7. Development of new cable bolting support systems.	10
8. Design a method of cut-and-fill for post pillar mining.	4 , 7

Dr. Michel L. Bilodeau, Associate Professor
Tel: (514) 398-4382

1. Development of micro computer sofware for evaluating new mine investment proposals. 2 , 11
2. Optimization of mine development and operating variables. 2 , 11
3. Risk analysis in mining investments. 2 , 11
4. Simulation of mine operating decisions. 2 , 11
5. Modelling of the aggregate market of Eastern North America. 2 , 11

Jeffrey I. Davidson, Lecturer
Tel: (514) 398-4375

1. Rehabilitation of old (abandoned, dormant) mines. 2 , 3
2. Technology for artisanal mining. 2 , 3

Dr. J. Peck, Research Associate
Tel: (514) 398-4373

1. Blasthole deviation mechanics and controls. 5 , 11
2. Drill bit wear and failure monitoring. 5 , 11
3. Performance monitoring of drilling. 5 , 11

Dr. R. Dimitrakopoulos, Research Associate
Tel: (514) 398-4374

1. Developments in geostatistics. 2 , 11
2. An expert system for geostatistical ore estimation. 2 , 11

Dr. M. Mazandarani, Research Associate
Tel:

1. Control engineering applications in mine automation. 5 , 11

Dr. John B. Edwards, Professor
Tel: (514) 398-6653

1. Scientific mining automation: simulation, modelling, vision control and robotics. 5 , 11

Dr. A.A. Afrouz, Lecturer
Tel: (514) 398-4378

1. Gate road supports 6 , 10
2. Development of monolithic and semi-monolithic pack materials for soft rock mining and hard rock bulkheads in backfill. 6 , 10
3. Pillar support mechanisms. 4 , 10
4. Ground control. 10
5. Slope stability and slope reinforcement. 4 , 10

Dr. H.S. Mitri, Assistant Professor
Tel: (514) 398-4375

1. Design and analysis of underground steel support systems.	4 , 10
2. Stability of underground excavations.	10
3. Study of numerical modelling techniques applicable in mining engineering.	3 , 11

Ralph Akhras, Research Associate, CCARM
Tel: (514) 398-4380 Ext. 5513

1. Automation of drilling machines.	5 , 7
2. Automation of grading ore.	8 , 11
3. Development of vision systems for use in closed-loop control of automated drill-hole operations.	5 , 11
4. Automated drill-hole pattern recognition with vision control.	5 , 11

Yves Lizotte, Adjunct Professor
Tel: (514) 398-4373 or (613) 992-9330

1. A semi-automated truck dispatching system.	8, 11
2. Optimization of fragmentation in underground blasthole mining.	7

Université du Québec à Chicoutimi
Centre d'étude sur
les ressources minérales
555, boul. Université
CHICOUTIMI, PQ,
G7H 2B1

G. Archambault
Directeur
Tel: (418) 545-5045
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
A. Rouleau et G. Archambault, professeurs	
1. Hydrogeology of fault and shear zones in crystalline bedrock.	10
2. Assessment (productivity) of precambrian bedrock aquifers at Burkina Faso.	10
3. Stochastic modelling of spatial distribution of deformation and fracturing in shear zones.	10
4. Experimental and developmental simulation (modelling) of a computer tool for the prediction of the effects of normal stiffness.	10
5. Numerical stochastic and experimental modelling of shear zones, and of induced fracturing in these zones.	10

Université du Québec
en Abitibi-Témiscamingue,
URSTM,
42, rue Mgr Rhéaume Est,
C.P. 700
ROUYN, PQ,
J9X 5E4

Denis Bois
Directeur
Tel: (819) 762-0971
Fax: (819) 797-4727

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
1. Literature search on artificial stereoscopic vision.	11

René Le, Professeur
Tel: (819) 762-0971

1. Developing human voice control of a video camera mounted on a remote mining machine.	11

Michel Aubertin,

1. Manual on measuring ground pressure (stress and strain).	10

Jean Lelièvre,
Tel: (819) 762-0971

1. Bioleaching of refractory gold ores.	12

Université Laval
Faculté des sciences et de génie
Département de mines et métallurgie
Cité Universitaire
SAINTE-FOY, PQ,
G1K 7P4

Dr. Pierre Choquet
Professeur en génie minier
Tel: (418) 656-5273
Fax:

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
1. Development of a computer program for the simulation of pulling or drawing ore from stope drawpoints.	7 , 8
2. Instrumentation of cable bolts in underground and open pit mines.	10
3. Improvement of sub-routine DISCO (solving principal stresses along discontinuity planes) to account for progressive failures, blasting effects and spacing/size of discontinuities.	4 , 10
4. Mechanics of toppling failure in rock slopes.	10
5. Preparation of a 'Technical guide for grouted cable-bolts used as ground support'.	4 , 10
6. Development and testing of a tension measuring gauge for cable bolts used for ground support.	10 , 11

Jean-Luc Collins, Professeur
Tel: (418) 656-2431

1. Utilisation of SUN 30 work station in the teaching of CAD techniques.	4 , 11
2. The effects of increasing truck size on the future relationship between open-pit and underground mining.	5 , 8

Kostas Fytas, Professeur
Tel: (418) 656-5057

1. Expert systems.	4 , 11
2. Optimization of production planning in open pit mines.	4
3. Simulation of shovel-truck operations.	5 , 11
4. Evaluation of non-parametric geostatistical techniques on the estimation of gold ore reserves (kriging, indicative and probabilistic).	7 , 2
5. Simulating mine ventilation systems and comparing with conventional and thermodynamic systems.	2
6. Estimation of underground air resistance (friction or k) factors.	2

Technical University of Nova Scotia,
Director of Minerals Engineering Centre,
Department of Mining
and Metallurgical Engineering,
P.O. Box 1000,
HALIFAX, NS,
B3J 2X4

Dr. L.A. Adorján
Head of Department,
Tel: (902) 420-7708
Fax: (902) 425-1037

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Concentration of Nova Scotia magnetite.	12
2. Beneficiation tests on marble.	12

Dr. H.A. Hancock, Professor
Tel: (902) 420-7778

1. Removal of manganese from Wabush iron ores.	12

Dr. D.S. Jones, Associate Professor
Tel: (902) 424-5618

1. Investigate the use of Nova Scotia produced anhydrite as a monolithic mine support pack material in coal mines.	10

Dr. M.C. Rockwell, Associate Professor
Tel: (902) 420-7696

1. Investigation of the characteristics and properties of Nova Scotia oil shales.	2

Dr. F.A. Jerabek, Associate Professor
Tel: (902) 420-7708

1. Rockbolt for low seams. 10

2. Sealing of curb ring against the shaft walls in shaft sinking operations. 5 , 6

3. Narrow vein mining: conceptual design of new stoping method and mechanization of stoping operations. 5 , 7

University of New Brunswick
Department of Geology
FREDERICTON, NB,
E3B 5A3

Dr. John G. Spray
Associate Professor
Tel: (506) 453-4804
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Wear mechanisms on excavator bucket teeth under rock quarrying conditions.	5
2. Study of severe rock alteration during the use of natural diamond and polycrystalline diamond compact drag bits at high speed.	5

British Columbia Research Corporation
Occupational Health Group,
3650 Wesbrook Mall
VANCOUVER, BC,
V6S 2L2

Elizabeth McDonald
Program Leader
Tel: (604) 224-4331
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Measurement of airborne dust concentrations and particle size fractions using area and personal sampling devices.	1
2. Determination of on-site field gas concentrations using sensitive continuous monitoring techniques.	1
3. Presentation of educational workshops on chemical handling, industrial hygiene and toxicology.	1
4. Assistance on selection of respiratory protective devices and the implementation and admistration of a respiratory protection program.	1
5. Identification and size-fraction counting of biological contaminants, such as mould and bacteria, found in the workplace atmosphere.	1
6. Measurement of the permeability of protective clothing to gases, vapours and liquids.	1
7. Identification of unknown gas reaction by-products and process emissions by gas chromatography and mass spectrometry.	1
8. Ergonomic and environmental assessment of open-pit haulage equipment: seating; access; control location and design; visibility; noise and vibration.	1 , 5
9. Ergonomic factors related to back injuries at mining operations: questionnaire and interview study.	1

New Era Engineering Corporation
Northern Mining and Energy Specialists
Box 4491,
WHITEHORSE, YK
Y1A 2R8

Randy Clarkson
Project Manager,
Tel: (403) 668-3978
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Gold losses at Klondike placer mines.	2 , 3
2. Assessing gold recovery at Klondike placer mines with radiotracers.	2 , 3

Manitoba Telephone Systems
MOBILE
P.O. Box 6666
1300 Ellice Avenue (CB19)
WINNIPEG, MB,
R3C 3V6

Dave C. Sloane
Engineering Services Manager
Tel: (204) 941-6404
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Underground handset communication system.	1

AISCO Inc.,
3264 Mainway,
BURLINGTON, ON,
L7R 3Y5

T.M. Hopkins
General Manager,
Tel: (416) 335-0002
Fax: (416) 335-9643

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Underground run-of-mine ore conveying system linking four ore passes to the gyratory crusher installation.	5 , 8
2. Development of down-the-hole drill (DTH) complete with computer controls and vision inspection system.	5 , 11
3. Design and prototype of battery-powered front-end loader with hydraulic drive.	5 , 11

Dynatec Engineering Ltd.,
2 East Beaver Creek Road
RICHMOND HILL, ON,
L4C 2N3

Fred A. Edwards, P.Eng.,
President
Tel: (416) 886-6950
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Development of rule-based expert system software for use in designing and providing specifications for mine shaft hoisting systems.	5 , 9

Mines Accident Prevention
Association of Ontario,
147 McIntyre Street W.
P.O. Box 1468
NORTH BAY, ON,
P1B 8K6

W. Coughlan
Executive Director, MAPAO,
Tel: (705) 472-4140
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Vibration dampening on hand-held pneumatic rock drilling machines.	5
2. Establish a Canadian standard for rockbolts based on ASTM-F432-83.	10

Luc A. Beauchamp, Ground Control Engineer.
Tel: (705) 472-4140

1. Field trials of ground penetrating radar technique for delineating fracture zones and fissures in rock masses.	10
2. Investigating novel techniques for monitoring tension in installed mechanically anchored rockbolts.	10

George V. Sotirov, Project Engineer.
Tel: (705) 472-4140

1. Standards/specifications for 600V contactor type GF/GM equipment.	5
2. Specifications and guidelines for repairs and testing of ANFO vessels.	5

3. Underground track haulage manual - materials and engineering guidelines. 8

4. Braking performance for rubber-tired, self-propelled underground mining machines. 5

5. Fire prevention and suppression on underground mobile equipment. 5

6. Retrieval of disabled remote-controlled LHD equipment. 5

Mining Industry Research
Organization of Canada, (MIROC),
c/o Department of Mining Engineering,
Queen's University
KINGSTON, ON,
K7L 3N6

P.N. Calder
Research Director MIROC
Tel: (613) 545-6655
Fax: (613) 545-6597

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Testing of the accuracy of NONEL detonators.	7
2. Quantitative vibration evaluation of rock drill handles.	1 , 5
3. Spray-on linings for supplementary underground support.	10
4. Evaluation of in-the-hole (ITH) dry drilling technology.	5 , 7
5. Automation of a rockbreaker.	5 , 11
6. Orepass hang-up relief - testing avalanche type guns.	5 , 7

Mining Research Directorate (MRD)
F523, Laurentian University
Ramsey Lake Road
SUDBURY, ON,
P3E 2C6

Charles B. Graham
Managing Director
Tel: (705) 673-6595
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Stope redevelopment through stabilized fill.	6 , 10
2. Ground support techniques for moderate rockburst protection.	10
3. Design of support for underground mining excavation in hard rock.	10
4. Shotcrete for rockburst protection.	3 , 10
5. Canada/Ontario/Industry Rockburst Research Project, Phase II.	10
6. Dilatometer for stiff fills.	10

J.S. Redpath Limited
P.O. Box 810
710 McKeown Avenue
NORTH BAY, ON,
P1B 8K1

M. O'Shaughnessey
Vice President and
General Manager
Tel: (705) 474-2461
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Redpath/Robbins shaft boring machine for boring shafts of 6 m to 7.3 m in diameter.	6 , 5
2. Tunnel boring machine for boring tunnels of 2 m to 2.5 m in diameter.	6 , 5
3. Winder-tensioner device for installing and tensioning hoist ropes.	5 , 9
4. Self-dumping crosshead for shaft sinking.	5
5. Full face sinking of small diameter shafts.	4 , 9
6. Automatic directional drilling using a raisebore machine.	5 , 9
7. Blind-hole drilling using a raisebore machine.	5 , 6
8. Boxhole drilling using a raisebore machine.	5 , 6

Strata Engineering Corp.,
170 Donway W.
Suite 410
DON MILLS, ON,
M3C 2G3

Camaran Mirza,
Principal
Tel: (416) 441-2560
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Recovery of surface crown pillar at Les Mines Selbaie using a control caving method.	10 , 11

Teledyne Canada Mining Products
35 Elgin Street N.
P.O. Box 130
THORNBURY, ON,
N0H 2P0

Dave Pal
President
Tel: (519) 599-2015
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Teledyne Loadrite; an electronic device to indicate the bucket 'load' for front end loaders (FELs).	7 , 11

Vadeko International Inc.
6535 Mill Creek Drive
Unit 62
MISSISSAUGA, ON,
L5N 2M2

Z. Hershtal
Vice President
Tel: (416) 821-3222
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Development, construction and testing of prototype accessories for automation of DTH drills.	5 , 11

Association minière du Québec Inc.
2635, boul. Hochelaga
Suite 942
SAINTE-FOY, PQ,
G1V 4W2

Dr. Claude Drouin
Directeur général
Tel: (418) 657-2016
Fax: 418 657-2154

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
1. Design of crown pillars.	4 , 10
2. Influence of organisational factors on safety in the work place.	1
3. Impact of various diverse quantifiable parameters on underground mining productivity.	1
4. Rockbolting procedures - ongoing technology transfer in this technical field.	10
5. The study of the impact of regulations on health and safety in the work place and the frequency of compensation claims made to the CSST.	1
6. Research on the exploitation of narrow veined ore bodies.	6 , 7
7. Participation with MITEC in the research work of the Canadian Centre for Automation and Robotics in Mining (CCARM).	5 , 11
8. Manual on techniques for evaluating ore bodies containing gold.	2

Dux Machinery Corporation,
615, rue Lavoisier
REPENTIGNY, PQ,
J6A 2E3

Hermann K. Bumueller
Président
Tel: (514) 581-8341
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Design and development of low profile teledump trucks for use in low headings in underground mines.	5 , 8
2. Design and development of an Airtrack drill equipped with a high-speed valveless pneumatic rock drill.	5 , 7

Machines Roger International Inc.,
C.P. 818,
2200 boulevard Industriel,
VAL D'OR, PQ,
J9P 4P8

Roger Massé
Président
Tel: (819) 825-4657
Fax: (819) 825-0698

PROJECT TITLE / TITRE DU PROJET	CATEGORY / CATÉGORIE
1. Research, design and development of a horizontal continuous mining machine.	5 , 11
2. Further research, design and development of a continuous mining machine for vertical and steep-angled excavation.	7 , 11

Lucien Grenier, Vice-président.
Tel: (819) 825-4657

1. Production of model V-30 horizontal continuous mining machine.	5 , 7

Noranda Inc.,
Centre de recherche Noranda,
Division de technologie minière,
240, boulevard Hymus
POINTE-CLAIRE, PQ,
H9R 1G5

Jacques H. Nantel
Directeur,
Tel: (514) 630-9300
Fax: (514) 630-9379

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Optimization of underground stope blast design.	4 , 7
2. Final stage of the development and testing of an ultra sonic survey probe for determining the contours of inaccessible open stopes or other mine openings.	9 , 11
3. Development of novel ground monitoring instrumentation : recoverable stressmeter, holographic stressmeter and closure meter.	10 , 11
4. Development of a rock mechanics ground control field data base for use in mine design and modelling techniques.	10
5. Development of a continuous mining machine for hard rock formations.	5 , 11
6. Develop numerical modelling for mine design; primarily using Finite Element and Boundary Element techniques.	10 , 11
7. Ground support optimization using cable support techniques for stabilizing mining excavations. Laboratory work backed by field applications.	4 , 10
8. Development of commercially viable instrumentation and/or computer systems for full-wave microseismic source location and blast vibration monitoring.	10 , 11
9. Remote control and guidance systems that would permit the operation of mining equipment beyond the visual range of the operator.	5 , 11
10. Automation of bucket loading cycle for LHD equipment.	5 , 11

11. Development of a portable blasthole survey instrument.	5 , 11
12. Investigation of the Kaiser Effect for the determination of in situ rock/ground stresses using drill core samples.	10 , 11
13. Development of a 3-D mine modelling program.	10 , 11
14. Development of automatic guidance systems for LHD equipment and off-highway trucks.	5 , 11
15. Installation and centralized monitoring of microseismic systems installed at operating mines in Central and Eastern Canada.	10 , 11
16. Transfer of the geomechanical stope design (dimensioning) technologies between the research centre and the field operation.	10 , 11
17. Development of the use of computer vision technology to operate rock breakers, eg. at an underground grizzly.	5 , 11
18. Development of a portable OTDR convergence meter for use in mine development operations.	4 , 11
19. Electronic delineation of geological features.	10
20. Mine ventilation automation.	9
21. Mine mobile equipment improvement.	5
22. Secondary ore dust explosions: blast gas evaluation.	7
23. Fire detection system for underground mines.	9
24. CO_2 mine ventilation control strategy.	9
25. New backfill technology.	10
26. Rock mass classification research.	7
27. Detection of radio frequency emissions during rock fragmentation.	7, 11

D.L. Sprott, Mining Engineer.
Tel: (514) 630-9348

1. Development of controlled blasting.	4 , 7
2. Development of a blasthole deviation monitor.	4 , 5
3. Development of a blast monitoring system.	4 , 5

Gilbert Sauriol, Scientifique sénior.
Tel: (514) 630-9300

1. To develop and test a mine-wide monitoring system.	4 , 11
2. To investigate the benefits of force feedback to remote control operation.	4 , 11
3. To investigate the use of electro-magnetic waves to locate drill holes.	4 , 11
4. To design and test an underground radio warning system.	4, 11

British Columbia Ministry of
Energy, Mines & Petroleum Resources,
Parliament Buildings,
VICTORIA, BC,
V8V 1X4

T.G. Carter,
Senior Mechanical/Electrical
Inspector,
Tel: (604) 356-2197
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Causes and alleviation of coal dust problems associated with coal transportation in low climatic temperatures.	1 , 8
2. Vehicle restraint systems and large off-highway haul truck dumping procedures.	5 , 8
3. A conveyor safety code for the design, operation and maintenance of conveyors and conveyor tracks.	5 , 8
4. Training programs for operators of machinery and equipment.	1 , 5
5. Training programs for maintenance personnel.	1 , 5
6. Update and expansion of a database containing information pertaining to design data and brake testing of large off-highway haul trucks qualified for use at mines in BC.	5 , 8
7. Remote control of vehicles.	5 , 8

R.F. King, Electrical Inspector of Mines,
Tel: (604) 356-2197

1. Underground and surface blasting operations during lightning storms - an evaluation of the hazard.	5
2. Grounding underground electrical systems	5
3. Safe grounding of portable electrical substations.	5 , 1

Alberta Office of Coal
Research and Technology
3rd Floor, Blue Cross Place,
10009 - 108 Street
EDMONTON, AB,
T5J 3C5

R.D. McDonald
Chairman
Tel: (403) 427-8042
Fax: (403) 422-0975

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Deformation and progressive failure of high walls in open pit mines.	10
2. Downhole geophysics.	3 , 10
3. Surface geophysical techniques for foothills and mountain coalfield exploration.	3 , 10
4. Automated machine control for optimized mining.	5 , 11
5. Dragline operations monitor.	5
6. Time-dependent behaviour of coal measure rocks.	10
7. Seismic modelling of shallow coalfields.	10

CANMET, Coal Research Laboratories,
Surface Mining Laboratory,
P.O. Bag 1280
DEVON, AB,
T0C 1E0

D. Bruce Stewart
Manager, Mining Research
Tel: (403) 987-8238
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Operations research for surface coal and oil sands mines, such as: time studies, computer simulation, equipment performance and computerized control technology.	3 , 4
2. Equipment selection and new technologies for surface coal and oil sands mining; (blast-casting, in-pit crushing/conveying, continuous mining equipment etc.).	4 , 5
3. Geotechnical engineering for surface coal and oil sands mines (pit walls, dumps, tailings dams etc.).	3 , 10
4. Spontaneous combustion evaluation and control technologies for coal and coal products during mining, processing, transportation and storage.	3 , 8
5. In situ oil sands recovery, including underground access technology.	4 , 12

Manitoba Department of Energy and Mines
Mines Branch
555-330 Graham Avenue
WINNIPEG, MB,
R3C 4E3

D.C. Cook
Project Coordinator
Tel: (204) 945-0491
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Overburden stabilization.	3
2. Secondary recovery of base metals by in situ bacterial leaching.	12
3. Evaluation of non-destructive testing (NDT) of hoisting ropes.	1 , 5
4. Development of a long-life pneumatic tire for underground use.	7 , 5

Saskatchewan Research Council,
15 Innovation Blvd.,
SASKATOON, SK,
S7N 2X8

Dave Eyre,
Manager, Engineering
Services Program,
Tel: (306) 933-8245
Fax: (306) 933-5493

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Design, development and manufacture of customised rock mechanics instrumentation for use in potash mines.	10 , 5
2. Large sample triaxial creep testing facility.	10

Randy Gillies, Manager, Pipeline Technology.
Tel: (306) 933-5473

1. Research in slurry pipeline technology including coal/crude oil slurry, emulsions and de-watered lignite.	8 , 5

Bryan T. Schreiner, Manager, Minerals/Ground water,
Tel: (306) 933-5495

1. Exploration technology such as mineralogy, geology, geochemistrty, X-ray diffraction and other related subjects.	2 , 3
2. Study of permeability of glacial fills and related ground water flow characteristics.	3
3. Environmental and ground water characteristics associated with potash mining operations.	3 , 9
4. Study of mine decommissioning options in respect to environmental matters.	1 , 3

Atomic Energy Control Board,
Health & Environmental Effects Section,
Research & Radiation Protection Branch,
Martel Building,
270 Albert Street,
OTTAWA, ON,
K1P 5S9

Dr. Harold Stocker
Chief, Health & Environment
Tel: (613) 995-2866
Fax: (613) 995-5086

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Scientific Authority for projects being undertaken by the Research and Radiation Protection Branch of AECB that are not listed hereunder.	1

Dr. P.J. Duport, Scientific Adviser
Tel: (613) 995-2896

1. Comparison of techniques used in estimating past exposures to radon daughters in Canadian mines.	1
2. Determine radon and thoron fluxes in Ontario and Saskatchewan mines to validate the VENTRAD mine ventilation network program.	1 , 9
3. Modified personal alpha dosimeter for Canadian miners.	1
4. Influence of tracer gases on the mobility of radon daughters.	1 , 9
5. Tracer gas method for assessing ventilation efficiency.	9
6. Technical evaluation of instant working level meter.	1 , 5
7. Assessment of errors on airflow measuring instruments.	1 , 9

Dr. J.L. Wallach, Scientific Adviser
Tel: (613) 995-2509

1. Study and evaluation of the implications of waste management of concentrating the slimes associated with uranium and non-uranium tailings. 3 , 12

2. Study of the natural erosion of surface and near-surface disposal facilities. 1 , 12

3. Study of the methodologies used for estimating the probability of radionuclide intrusion through engineered barriers used in the disposal of low-level nuclear wastes. 1 , 12

Dr. M. Rao Avadhanula, Scientific Adviser
Tel: (613) 995-2618

1. Re-measurement of Th-230 in the pore water of the Lacnor mine tailings. 1 , 12

2. Calibration/validation of FEMWATER/FEMWASTE on the Nordic mine site. 1 , 12

3. Radionuclide concentration in fish: Phase I-Screening Program. 1 , 3

Dr. D.J. Martin, Scientific Adviser
Tel: (613) 995-2768

1. Optimization in the decommissioning of uranium tailings. 1 , 12

V. Elaguppillai, Scientific Adviser
Tel: (613) 995-3041

1. Ontario Miners Mortality Study - Phase II. 1 , 9

2. Evaluation of exposure records of Eldorado uranium miners. 1 , 9

CANMET, Mining Research Laboratories,
Energy, Mines and Resources,
555 Booth Street
OTTAWA, ON,
K1A 0G1

Dr. J. Udd
Director, MRL
Tel: (613) 996-8603
Fax: 613-995-3456

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
CANMET, IN-HOUSE RESEARCH	
Elliot Lake Laboratory	
1. Tripartite rockburst research program: Canada (CANMET), Ontario and Ontario mining industry: Investigating stability and rockburst activity in mines.	4 , 10
2. Identification of major sources of radiation and the factors affecting the release of radiation in mines; study by tracer gas and radiation	1 , 9
3. Evaluation of pillar stability on a local and regional scale in Canadian hardrock mines and determination of pre-mining stresses in rockburst-prone mines.	1 , 10
4. Develop new seismic equipment and monitoring techniques for studying rockbursts in hardrock mines and to carry out seismic studies.	10 , 11
5. Development and operation of air analysis facility using tracer gas techniques for evaluation of mine ventilation circuits.	1 , 9
6. Optimization of mine ventilation circuits. Development of air management (direct flow and recirculation) and pollution and energy control capabilities.	1 , 9
7. Establish and operate state-of-the-art dust tunnel facility for calibration of respirable dust measuring and sampling instruments.	1 , 9
8. Establishment of X-ray diffraction analysis facility for evaluation of airborne silica dusts in mine airways.	1 , 9

9. Development of monitoring system for respirable dust and particulates emanating from diesel emissions in mine airways and ventilation circuits. 1 , 9

10. Assessment of airflow measuring devices and instruments used for the detection of radiation in underground mine airways. 1 , 9

11. Establish and operate the National Radon and Thoron Facility (NRTF) for calibrating and testing radiation measuring equipment. 1 , 9

12. Conduct radon and radon daughter surveys in mines to evaluate radiation levels in working places. 1 , 9

13. Study of the migration patterns of metals and radionuclides associated with uranium mine tailings. 1 , 9

14. Development and evaluation of instruments for the rapid determination of radon and thoron daughters in mine environments. 1 , 9

15. Study of wet barriers on/in pyritic uranium tailings to develop procedures to control acid generation. 1 , 9

Sudbury Laboratory

1. Installation, calibration and commissioning of equipment at MRL's Backfill Laboratory in Sudbury. 3 , 10

2. Review of laboratory and in situ testing methods for establishing the physical and engineering properties of mine backfill materials. 3 , 10

3. Determination of alternative backfill materials for Ontario Mines (Ontario MDA). 3 , 10

Canadian Mining Technology Laboratory

1.	Carry out analytical numerical modelling studies as part of applied ground control investigations - Numerical Modelling Group.	10 , 11
2.	Developing field and laboratory methods, equipment and procedures to assess the suitability of rock formations for high-level radioactive waste containment.	3
3.	Develop new ore reserve evaluation methodologies.	3
4.	Research to increase potash recoveries in Canadian mines.	4 , 10
5.	Maintaining a database of information on current and developing mining technology. (Mining Technology Index)	1 , 9
6.	Developing a handbook for the safe and economic design of surface crown pillars.	4 , 10
7.	Establish the strength, deformational characteristics and other physical properties of rock types encountered in rock mechanics research investigations.	10
8.	Evaluation of rock mass stability for surface crown pillars.	10
9.	Develop new rock mechanics tests and test procedures.	3 , 10
10.	Establish data bank on peak and residual rock strengths and other physical properties of rocks commonly encountered in Canadian mining operations.	3 , 10
11.	Development of a reliable high resolution radial monitoring device for recording changes in borehole diameter due to stress caused by mining operations.	3 , 5
12.	Calculation of ore reserves for mineral deposits other than uranium.	2 , 3
13.	Study of heat control in underground hardrock mines, especially control of heat flow in cold environment mines located in permafrost regions.	3 , 10

14. Materials handling and operations research regarding the development and implementation of truck dispatching systems. 1 , 8

15. Ore grade control and blending requirements in mining operations. 3 , 8

16. Study of rock fragmentation as a result of using explosives for rock breakage. 7

17. Study of rock breakage by mechanical excavation and cutting techniques in hardrock conditions. 5 , 7

18. Study of small mine operating costs and development of suitable software to estimate operating costs. 2 , 11

19. Development of borehole instrumentation to monitor ground stress conditions. 5 , 10

20. Development of a software package to accommodate conceptual and operating mine design functions. 2 , 11

Canadian Explosives Atmospheres Laboratory (CEAL)

1. Certification of explosion-proof equipment, fire-resistant materials and gas detection instruments. Technical information and certification service. 1

2. Transfer and privatization of diesel emission control technology. 1 , 5

3. Monitoring the continuing regulatory compliance ref. apparatus and materials certified by EMR, and maintain a certification history of EMR certified products. 1

4. Participation in the development of standards related to the certification of apparatus and materials for use in gassy mines. 1 , 5

5. Investigation and study of sulphide ore dust explosions. 1 , 8

6. Control of coal and other dust explosions. 1 , 8

7. Development of laboratory facilities for studying dust and gas explosions. 1

8. Research and development of alternate ceramic filter materials suitable for diesel emission control units. 1 , 5

9. Development of a facility to study automated data collection and vehicle cycle simulation for diesel engines. 1

10. Collection and compilation of historical data on wire rope examination and testing; pertaining particularly to hoisting equipment. 1 , 8

11. Study of automated control of ventilation systems in Ontario mines. 9

12. Underground field studies to assess air quality in Canadian mines; associated with the AQI studies. 1 , 9

Canadian Explosives Research Laboratory (CERL)

1. Certification of explosives materials and devices. 1

2. Enhance explosives certification capabilities and develop new certification standards and procedures. 1

3. Provision of consultation services regarding explosive subtances, materials and devices. 1

4. Explosives, propellants and pyrotechnics research; specifically thermal properties and numerical modelling technology. 1

CANMET, CONTRACT RESEARCH

1. Regional subsidence related to potash mining operations. (Central Canada Potash) 10

2. Determination of the PAH partition ratio and nature of mutagens generated by catalytic purifiers (Laurentian University). 11

3. Rock mass characterization and retro-analyses of existing and failed surface crown pillars in hard rock mines (Golder Associates). 10

4. Determination of mechanical and structural properties or characteristics of surface crown pillars (Trow Associates). 10 , 3

5. Seismic characterization of discontinuities and anomalous rock faults in surface crown pillars using alteration and velocity imaging (Queen's University). 10 , 3

6. Recovery of surface crown pillars overlain by 40 m of overburden at Les Mines Selbaie using a controlled caving method of mining. 3 , 10

7. Study and evaluation of sulphide dust/SO2 monitoring systems (Noranda Research). 1 , 9

8. Study of the fundamentals of coal dust explosions (McGill University). 1

9. Study of the effect of scale on dust explosions (AECL Whiteshell Laboratory). 1

10. Study of methane/coal dust explosions (Technical University of NS). 1

11. Study and evaluation of CO2 as a surrogate for all diesel pollutants in the mine atmosphere (Noranda Research/Brunswick Mine). 1 , 9

12. Evaluation of the impact of animal studies on mine ventilation (I.W.French). 1 , 9

13. Study and assessment of equipment and apparatus for the non-destructive testing of wire ropes, particularly mine hoist ropes (L.Geller). 9 , 5

14. Development of a 3-D computer software system for open pit and underground mine planning and design (Lynx Canada Expl. Ltd.).	2 , 11
15. Study of the influence of diverse variables on underground mining productivity in Québec. (AMMQ)	1 , 2
16. Study and evaluation of chemical grouting techniques in underground mines (Domtar, Gypsum Division).	5 , 10
17. Study of mining methods relative to Canadian and non-Canadian mines exploiting narrow-veined ore bodies. (Consortia)	2 , 4
18. Design, construction and testing of a retrofit package for a commercial raiseborer for blind drilling operations in hard rock mines (IRAP Project).	5
19. Development of a low-cost conveyor system with special attention to environmental problems of dust emission. (IRAP Project)	1 , 5
20. Development of a 3D mine planning and design software package for operating mines (Lynx Geosystems Inc.).	4 , 11
21. Identification of needs and required trends in mining equipment design from point of view of Canadian mine operations (Custom Industrial Automation).	5
22. Development of a compact underground boring machine (CUB) for use in hard rock conditions. (IRAP Project)	5

MINERAL DEVELOPMENT AGREEMENTS.

Mineral Development Agreements stimulate the development of mineral resources in the Provinces participating in these jointly funded EMR - Provincial programs. The CANMET Mining Research Laboratories (MRL) is also involved in similar programs, such as the Northern Technical Assistance Program (NTAP) jointly funded by the Department of Indian and Northern Affairs and the Northwest Territories.

At present, MRL is involved with five MDA programs and also the NWT-NTAP.

The projects initiated under these agreements, in accordance with specific objectives stipulated in the technical programs, are jointly funded by the federal government with industry under different scenarios, depending on the risks involved and the nature of the work being undertaken.

Between 1984 and 1989, four provinces: Ontario, New Brunswick, Manitoba and Saskatchewan signed agreements with technical program components. In 1989, Québec initiated a technical program valued at $2M and the Northwest Territories are funding research and development projects in mining technology. The total funding allocated to these technical programs amounts to $10.1M. By the end of this financial year, a total of $8,279.3M will have been spent on MDA programs, of which $1,701.1M will be applicable to the current year.

With the exception of the Ontario and Québec MDAs, which terminate on March 31, 1991, the other MDA projects will be concluded by March 31, 1990. Negotiations are presently on-going with several provinces for renewal of these MDAs. At the time of going to print CANMET/MRL were concerned with the following MDA projects:

New Brunswick.

1. Monitoring CO2 in mine ventilation systems.
2. Ground control monitoring surveys in potash and salt mines.
3. Evaluation of improved NDT for mine wire ropes.
4. Reducing sulphide ore dust explosions.

Québec

1. Mining techniques for small veined ore bodies.
2. Technical and economical feasibility of mine backfill.
3. Expert systems for the use and maintenance with hoisting system in mines.
4. Vibration measurement and analysis of jacklegs used in underground mines.

Ontario

1. 3-D numerical modelling for bulk mining operations.
2. Backfill alternatives for Ontario mines.
3. Use of cemented fills for controlling violent failures in pillars.

Manitoba

1. Optimization of blast design for blasthole mining operations.
2. Development of guidelines for vertical block mining (VBM).
3. Development of geomechanical data base for ground control in deep mines.
4. Ground stability evaluation of en-echelon ore bodies.

Northwest Territories

1. Post pillar recovery strategies at Nanisivik mine.
2. Blast design at Lupin mine.
3. Heat flow model calibration at Polaris Mine.

CANMET, Mineral Science Laboratories
Concrete Technology Section
555 Booth Street
OTTAWA, ON,
K1A 0G1

Dr. Esther Douglas
Tel: (613) 992-6455
Fax: (613) 992-9389

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Joint research project with Falconbridge Mines Ltd dealing with the utilization of Kidd Creek granulated copper slag in consolidated rock fill.	10

Ontario Ministry of Labour,
Mining Health and Saftey Branch,
OH&S Division,
260 Cedar Street,
SUDBURY, ON,
P3B 3X2

J.J. Lazurko,
Chief Engineer - Technical,
Tel: (705) 675-4468
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Joint CANMET/Ontario MOL/Industry rockburst research program.	10
2. Wire rope and hoisting technology. CANMET/Ontario MOL/USBM joint project.	5 , 9
3. Diesel emissions in underground U.S. mines. Ontario MOL/USBM joint project.	5 , 1
4. Evaluation of a non-destructive testing device for mine shaft wire ropes. CANMET/Ontario MOL/USBM joint project.	9
5. Promotion of the Crisis Management Program (CRIMP) mine safety program(s).	1 , 3

Centre de recherches minérales
Ministère de l'Énergie
et des Ressources
Complexe Scientifique
2700, rue Einstein
SAINTE-FOY, PQ,
G1P 3W8

Jean-Marc Robert, ing.
Chef intérimaire du STM.,
Tel: (418) 643-4540
Fax: (418) 643-6706

	PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1.	Computerization of mine operations; application and adaption of CAO/CAD modelling software.	10 , 11
2.	Manual of technology applicable to mining machines.	5 , 9
3.	Research to develop an expert system in ground support.	11
4.	Portfolio of underground mining methods and operations.	2 , 6
5.	Techniques for predicting acid mine drainage problems.	3
6.	Prevention and elimination of acid mine drainage problems.	3
7.	Commissioning systems for the treatment of natural acid mine drainage water.	3
8.	Update information on tunnelling and continuous mining machines.	5
9.	Compile and edit a manual on the criteria, parameters and techniques for the planning and design of open pit mines.	4
10.	Establishing a centre for mine ventilation calculations and simulation to service Québec mines.	4 , 9
11.	Escalate the development of expert systems in various fields of application related to the mining industry.	11
12.	Development and dissemination of techniques for measurement of in situ rock property parameters.	10

13. Upgrading the Rock Mechanics Laboratory at CRM. 10

14. Studying methods for establishing the dimensions of u/g openings. 4 , 10

15. Methods for monitoring and sounding ground/rock conditions. 10

16. Improvement of the controls for rock breaking with explosives. 7

17. Developing reliable consistent monitoring techniques for acid mine drainage. 3

CANMET, Coal Research Laboratories,
Cape Breton Coal Research Laboratory,
210 George Street
SYDNEY, NS,
B1P 1J3

G.A. Haslett
Group Leader
Tel: (902) 564-7673
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Methane prediction and control in underground coal mines.	4 , 9
2. Airborne dust control in collieries.	4 , 9
3. Ventilation performance and control in underground coal mines.	4 , 9
4. Evaluation of hardwood packs.	10
5. Rockbolting systems for roadway/gateway support.	10
6. Evaluation of shearer extraction drum performance.	5 , 11
7. Split set sling trial.	10
8. In situ stress measurements (face workings and roadways)	10
9. Sea floor subsidence.	10
10. Numerical modelling as an aid to mine design.	4

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and Safety Commission
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500 Beaverbrook Court
FREDERICTON, NB,
E3B 5H1

R. Blanchard
Director Inspection Services,
Tel: (506) 453-2467
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
1. Evaluation of non-destructive hoist rope testing equipment.	5 , 9

Research & Productivity Council
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FREDERICTON, NB,
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D. Abbot
Manager R & D,
Tel: (506) 452-8994
Fax:

PROJECT TITLE TITRE DU PROJET	CATEGORY CATÉGORIE
Dr. J.C. Thornley, Senior Metallurgist. Tel: (506) 452-8996	
1. Examination of mining ropes to determine mechanism of failure.	5
Lee Danisch, Head, Electronics Division. Tel: (506) 452-8994	
1. Maximization of dragline operations by developing expert systems to monitor operating parameters.	5 , 11

SECTION 2

Projects Listed by Categories

MINE INDEX CATEGORIES

1. ADMINISTRATION : Mine Administration includes manpower training and development, health and safety of employees, management organization, voice communication, data communication, remote monitoring and labour relations.

2. FEASIBILITY : Mine Feasibility includes economic studies, mine evaluations, cost estimations and other projects undertaken to determine the potential success of major capital expenditures to develop a new mine, rehabilitate an old mine or expand an existing mine for increased production or better productivities.

3. SURFACE TECHNOLOGY : Surface Technology includes prospection, exploration, sampling, modelling, geostatistics, hydrology and geotechnology. It will also include projects dealing with environmental subjects, waste management, dewatering and other site work such as roads, bridges, dams and runways.

4. DESIGN : Mine Design includes selecting stope and pillar patterns and mining methods for new mines or for existing operations that are to be modernized or expanded. The category also includes planning, scheduling and grade control.

5. EQUIPMENT : Equipment includes equipment design, selection and maintenance as well as installed and consumable supplies.

6. DEVELOPMENT : Development includes methods of advancing mine and stope access headings leading to the fragmentation and removal of the muck to the haulage system.

7. PRODUCTION : Stoping includes operational topics such as fragmentation, blast pattern design, drilling methods, explosives and all other matters connected to preparing a block of ore, either a stope or a pillar, for drilling and blasting and removal of the fragments to the haulage system.

8. MATERIALS HANDLING : Materials Handling includes the movement of fragmented material, from stope or development heading, via loading/transportation systems, grizzlies, rock-breakers, ore passes, crushers, surge and storage bins and loading pockets to surface.

9. SERVICES : Mine Services include ventilation, surveying, compressed air, dewatering systems, air heating, hoisting plant (hoist, headframe, shaft conveyances and all shaft installations) and electrical supply, control and distribution.

10. GROUND CONTROL : Ground Control includes rock mechanic studies, ground support mechanisms and ground support preparation, placement and installation.

11. HIGH TECH : High Tech includes computers, robotics, water jets or other new and innovative systems.

12. PROCESSING : Processing includes general milling operations, mill recoveries, concentrate grades, reagent consumption, etc., as well as in-situ and heap leaching operations on surface or underground, and recovering economic values from tailings and waste dumps.

1. ADMINISTRATION

	PROJECT TITLE / TITRE DU PROJET	PAGE
1.	Measurement of the permeability of protective clothing to gases, vapours and liquids.	103
2.	Identification and size-fraction counting of biological contaminants, such as mould and bacteria in the workplace atmosphere.	103
3.	Assistance on selection of respiratory protective devices and the implementation and admistration of a respiratory protection program.	103
4.	Presentation of educational workshops on chemical handling, industrial hygiene and toxicology.	103
5.	Determination of on-site field gas concentrations using sensitive continuous monitoring techniques.	103
6.	Measurement of airborne dust concentrations and particle size fractions using area and personal sampling devices.	103
7.	Identification of unknown gas reaction by-products and process emissions by gas chromatography and mass spectrometry.	103
8.	Ergonomic factors related to back injuries at mining operations: questionnaire and interview study.	103
9.	Ergonomic and environmental assessment of open-pit haulage equipment: seating; access; control location and design; visibility; noise and vibration.	103
10.	Development of PNET program for project scheduling.	68
11.	Examination of sulphide dust explosions in Canadian mines.	68
12.	Evaluation of ceramic exhaust filters on load haul dump (LHD) equipment.	15

PROJECT TITLE / TITRE DU PROJET	PAGE
13. Development of mine-wide computerized database system.	9
14. Evaluation of non-destructive testing (NDT) of hoisting ropes.	125
15. Introduction of the 'Demmings Philosopy' to mining applications.	64
16. Managing for consistency courses as part of a continuous management improvement strategy.	64
17. Quantitative vibration evaluation of rock-drill handles.	84
18. Quantitative vibration evaluation of rock-drill handles.	110
19. A model to predict toxic fumes from explosives and dilution ventilation.	84
20. Computerization of ventilation surveys.	44
21. Development and evaluation of instruments for the rapid determination of radon and thoron daughters in mine environments.	131
22. Establishment of X-ray diffraction analysis facility for evaluation of airborne silica dusts in mine airways.	130
23. Development and operation of air analysis facility using tracer gas techniques for evaluation of mine ventilation circuits.	130
24. Development of monitoring system for respirable dust and particulates emanating from diesel emissions in mine airways and ventilation circuits.	131
25. Optimization of mine ventilation circuits. Development of air management (direct flow and recirculation) and pollution and energy control capabilities.	130
26. Assessment of airflow measuring devices and instruments used for the detection of radiation in underground mine airways.	131

PROJECT TITLE / TITRE DU PROJET	PAGE
27. Establish and operate the National Radon and Thoron Facility (NRTF) for calibrating and testing radiation measuring equipment.	131
28. Conduct radon and radon daughter surveys in mines to evaluate radiation levels in working places.	131
29. Identification of major sources of radiation and the factors affecting the release of radiation in mines; study by tracer gas and radiation.	130
30. Establish and operate state-of-the-art dust tunnel facility for calibration of respirable dust measuring and sampling instruments.	130
31. Study of the migration patterns of metals and radionuclides associated with uranium mine tailings.	131
32. Study of wet barriers on/in pyritic uranium tailings to develop procedures to control acid generation.	131
33. Evaluation of pillar stability on a local and regional scale in Canadian hardrock mines and determination of pre-mining stresses in rockburst-prone mines.	130
34. Materials handling and operations research regarding the development and implementation of truck dispatching systems.	133
35. Maintaining a database of information on current and developing mining technology. (Mining Technology Index)	132
36. Development of laboratory facilities for studying dust and gas explosions.	134
37. Monitoring the continuing regulatory compliance ref. apparatus and materials certified by EMR, and maintain a certification history of EMR certified products.	134

PROJECT TITLE
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38. Certification of explosion-proof equipment, fire-resistant materials and gas detection instruments. Technical information and certification service. 134

39. Development of a facility to study automated data collection and vehicle cycle simulation for diesel engines. 134

40. Participation in the development of standards related to the certification of apparatus and materials for use in gassy mines. 134

41. Transfer and privatization of diesel emission control technology 134

42. Research and development of alternate ceramic filter materials suitable for diesel emission control units. 134

43. Collection and compilation of historical data on wire rope examination and testing; pertaining particularly to hoisting equipment. 134

44. Control of coal and other dust explosions. 134

45. Investigation and study of sulphide ore dust explosions. 134

46. Underground field studies to assess air quality in Canadian mines; associated with the AQI studies. 134

47. Certification of explosives materials and devices. 135

48. Explosives, propellants and pyrotechnics research; specifically thermal properties and numerical modelling technology. 135

49. Provision of consultation services regarding explosive subtances, materials and devices. 135

50. Enhance explosives certification capabilities and develop new certification standards and procedures. 135

PROJECT TITLE / TITRE DU PROJET	PAGE
51. Study of the fundamentals of coal dust explosions.	136
52. Study of the effect of scale on dust explosions.	136
53. Study of methane/coal dust explosions.	136
54. Study of the influence of diverse variables on underground mining productivity in Québec.	137
55. Development of a low-cost conveyor system with special attention to environmental problems of dust emission.	137
56. Study and evaluation of sulphide dust/SO2 monitoring systems.	137
57. Evaluation of the impact of animal studies on mine ventilation.	136
58. Study and evaluation of CO_2 as a surrogate for all diesel pollutants in the mine atmosphere.	136
59. Development of a computerized surveying system for using AUTOCAD to update mine plans and store survey pickups.	27
60. Underground radio communications.	46
61. Improvement of underground radio communications.	32
62. Quantitative vibration evaluation of rock drill handles	110
63. Mine radio system - leaky feeder technology.	42
64. Promotion of the Crisis Management Program (CRIMP) mine safety program(s).	141
65. Diesel emissions in underground US mines. Ontario MOL/USBM joint project.	141

	PROJECT TITLE / TITRE DU PROJET	PAGE
66.	Comparative study of jackleg drills.	91
67.	Modelling (simulation) of the productivity of single mining machines, man-machine synergism and machine systems.	91
68.	Remote surveillance of mine plant entrances.	49
69.	Development of alternative grading categories for chrysotile asbestos.	50
70.	Communication systems for underground workers.	62
71.	Influence of organisational factors on safety in the work place.	116
72.	Impact of various diverse quantifiable parameters on underground mining productivity.	116
73.	The study of the impact of regulations on health and safety in the work place and the frequency of compensation claims made to the CSST.	116
74.	Study of mine decommissioning options in respect to environmental matters.	126
75.	Install and commission u/g radio communications system.	36
76.	Study of sulphide dust explosions in Canadian mines - a fine particle approach.	78
77.	Work-related health and safety.	61
78.	Implementation of mine wide underground radio communication system.	41
79.	Underground handset communication system.	105
80.	Transmission of video camera images by microwave and the programming of these cameras by telephone communications.	58

PROJECT TITLE TITRE DU PROJET	PAGE
81. Determination of the nitro PAHs and mutagens generated by the catalytic converters used on underground diesel equipment.	77
82. The lifetimes and pathways of the PAHs and mutagens in dieselized underground mines.	77
83. Study of the development of data communications systems for use underground.	88
84. Training programs for maintenance personnel.	122
85. Training programs for operators of machinery and equipment.	122
86. Causes and alleviation of coal dust problems associated with coal transportation in low climatic temperatures.	122
87. Safe grounding of portable electrical substations.	122
88. Study ways and means to attenuate vibration exposure for drill doctors and drill sharpening personnel.	38
89. Development of engineering controls for environmental noise attenuation and personal hearing protection.	38
90. Development of computer programs to monitor exposure of workers to various specified environmental toxic pollutants.	39
91. Research on causes, effects and prevention of sulphide dust explosions.	38
92. Projects being undertaken by the Research and Radiation Protection Branch of AECB that are not listed individually in Section 1 of Index.	127
93. Modified personal alpha dosimeter for Canadian miners.	127

	PROJECT TITLE / TITRE DU PROJET	PAGE
94.	Comparison of techniques used in estimating past exposures to radon daughters in Canadian mines.	127
95.	Technical evaluation of instant working level meter.	127
96.	Assessment of errors on airflow measuring instruments.	127
97.	Determine radon and thoron fluxes in Ontario and Saskatchewan mines to validate the VENTRAD mine ventilation network program.	127
98.	Influence of tracer gases on the mobility of radon daughters.	127
99.	Study of the natural erosion of surface and near-surface disposal facilities.	128
100.	Study of the methodologies used for estimating the probability of radionuclide intrusion through engineered barriers used in the disposal of low-level nuclear wastes.	128
101.	Radionuclide concentration in fish: Phase I Screening Program.	128
102.	Re-measurement of Th-230 in the pore water of the Lacnor mine tailings.	128
103.	Calibration/validation of FEMWATER/FEMWASTE on the Nordic mine site.	128
104.	Optimization in the decommissioning of uranium tailings.	128
105.	Evaluation of exposure records of Eldorado uranium miners.	129
106.	Ontario Miners Mortality Study - Phase II.	129
107.	Design of a control system to accommodate flexible costs and permit steady operational progress.	47

2. FEASIBILITY

	PROJECT TITLE / TITRE DU PROJET	PAGE
1.	Feasibility evaluation of coal transport conveyor.	11
2.	Computer program for estimating capital and operating costs and update of CIM.	68
3.	Ore deposit modelling of polymetallic veins, Owen Lake, B.C.	68
4.	Co-kriging as an aid to reserve estimation of precious metals.	68
5.	Open pit simulation studies.	81
6.	Computerized open pit feasibility and design.	81
7.	Use of total tailings for backfill support.	81
8.	Open pit mine surveying, planning and economic analysis.	83
9.	Feasibility study for rehabilitation of Paymaster orebody.	44
10.	Calculation of ore reserves for mineral deposits other than uranium.	132
11.	Study of small mine operating costs and development of suitable software to estimate operating costs.	133
12.	Development of a software package to accommodate conceptual and operating mine design functions.	133
13.	Study of the influence of diverse variables on underground mining productivity in Québec.	137
14.	Study of mining methods relative to Canadian and non-canadian mines exploiting narrow veined ore bodies.	137
15.	Development of a 3-D computer software system for open pit and underground mine planning and design.	137

	PROJECT TITLE / TITRE DU PROJET	PAGE
16.	Evaluation of remote control operation of multiple underground rockbreakers.	27
17.	Trials and evaluation of fracturing and in situ bacterial leaching of sub marginal uranium ore; ie. not in ore reserves.	46
18.	Guidance systems for underground vehicles.	31
19.	Computerization of cross-sectional block ore reserves using Geostat International Sectcad software and DBase III software for the drill hole and mine opening database.	43
20.	Copper and the world market.	91
21.	Cut-off grades.	91
22.	Estimation of underground air resistance (friction, k) factors.	99
23.	Simulation of mine ventilation systems and comparing with conventional and thermodynamic systems.	99
24.	Evaluation of non-parametric geostatistical techniques on the estimation of gold ore reserves (kriging, indicative and probabalistic).	99
25.	Developments in geostatistics.	94
26.	An expert system for geostatistical ore estimation.	94
27.	Optimization of mine development and operating variables.	93
28.	Risk analysis in mining investments.	93
29.	Simulation of mine operating decisions.	93
30.	Modelling of the aggregate market of Eastern North America.	93

PROJECT TITLE / TITRE DU PROJET	PAGE
31. Development of micro computer sofware for the evaluation new mine investment proposals.	93
32. Technology for artisanal mining.	93
33. Rehabilitation of old (abandoned, dormant) mines.	93
34. Studying the feasibility of establishing an impervious barrier to prevent water inflow in mines.	49
35. Portfolio of underground mining methods and operations.	142
36. Manual on evaluation techniques for ore bodies containing gold.	116
37. Solution mining for disposal of salt tailings.	16
38. Exploration technology such as mineralogy, geology, geochemistrty, X-ray diffraction and other related subjects.	126
39. Investigation of the characteristics and properties of Nova Scotia oil shales.	100
40. Testing feasibility of replacing posts in timbered drifts with cable slings.	35
41. Bucket load weighing unit for hydraulic shovels.	14
42. Improvements to truck washing facilities to reduce downtime currently associated with length of time required for steam units prior to conducting maintenance routines.	14
43. Investigation of light charged particles emitted by rocks during fracture.	77
44. Thick seam underground coal mining demonstration project.	24

PROJECT TITLE
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45. Design of guidelines, or a manual, for the primary evaluation of exploration properties or mine sites. 47

46. Gold losses at Klondike placer mine. 104

47. Assessing gold recovery at Klondike placer mines with radiotracers (1989) Preliminary Summary. 104

48. Heath Steele waste rock study - three phases. 66

3. SURFACE TECHNOLOGY

PROJECT TITLE / TITRE DU PROJET	PAGE
1. Ore haulage road dust control methods.	5
2. Sub-aerial tailings deposition.	15
3. Cementation of waste rock to effect control of acid mine drainage.	15
4. Overburden stabilization.	125
5. Open pit mine surveying, planning and economic analysis.	83
6. Reconciliation of grade control and production statistics with geostatistically defined ore reserves and mineral inventories.	83
7. Remote automatic real time survey slope monitoring systems using radio telemetry.	83
8. Review of laboratory and in situ testing methods for establishing the physical and engineering properties of mine backfill materials.	131
9. Installation, calibration and commissioning of equipment at MRL's backfill laboratory in Sudbury.	131
10. Determination of alternative backfill materials for Ontario mines.	131
11. Calculation of ore reserves for mineral deposits other than uranium.	132
12. Developing field and laboratory methods, equipment and procedures to assess the suitability of rock formations for high-level radioactive waste containment.	132
13. Develop new ore reserve evaluation methodologies.	132
14. Development of a reliable high resolution radial monitoring device for recording changes in borehole diameter due to stress caused by mining operations.	132

	PROJECT TITLE / TITRE DU PROJET	PAGE
15.	Ore grade control and blending requirements in mining operations.	133
16.	Develop new rock mechanics tests and test procedures.	132
17.	Study of heat control in underground hardrock mines, especially control of heat flow in cold environment mines located in permafrost regions.	132
18.	Establish data bank on peak and residual rock strengths and other physical properties for rocks commonly encountered in Canadian mining operations.	132
19.	Recovery of surface crown pillars overlain by 40 m of overburden at Les Mines Selbaie using a controlled caving method of mining.	136
20.	Seismic characterization of discontinuities and anomalous rock faults in surface crown pillars using alteration and velocity imaging.	136
21.	Determination of mechanical and structural properties or characteristics of surface crown pillars.	136
22.	Promotion of the Crisis Management Program (CRIMP) mine safety program(s).	141
23.	Processes for obtaining environmentally safe uranium mill tailings.	74
24.	Sonic drill - use of high-frequency mechanical oscillation to achieve faster drilling rates.	74
25.	Development of data concerning the hydraulic properties of road aggregates.	90
26.	Anisotropy of the shear resistant clays.	90
27.	Impervious properties of soil-bentonite mixtures (water retention by tailings).	90

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28. Influence of drill water on ground permeability measurement.	90
29. Determining the significance of permeability data obtained during pumping tests.	90
30. Hydraulic-mechanical interaction during in situ permeability tests.	90
31. Hydrogeological mapping of water-bearing risk zones.	90
32. Cut-off grades.	91
33. Geotechnical design of impervious barriers in mine tailings that generate acid waters.	90
34. Environmental aspects of using backfill in mines.	90
35. Anisotropic effects of the shear resistance of clays on measurements by in situ shear testing.	90
36. Technology for artisanal mining.	93
37. Rehabilitation of old (abandoned, dormant) mines.	93
38. Study of numerical modelling techniques applicable in mining engineering.	95
39. Surveying the ground water conditions in and around an ore body.	49
40. Strategic evaluation of the options available for managing asbestos tailings.	49
41. Strategic evaluation study of management options for asbestos tailings.	50
42. Commissioning systems for the treatment of natural acid mine drainage water.	142

PROJECT TITLE / TITRE DU PROJET	PAGE
43. Developing reliable consistent monitoring techniques for acid mine drainage.	143
44. Prevention and elemination of acid mine drainage problems.	142
45. Techniques for predicting acid mine drainage problems.	142
46. Solution mining for disposal of salt tailings.	16
47. Seismicity and geophysical engineering in potash mines.	72
48. The factors affecting slope stability in surface coal mines.	73
49. Slope stability studies in Southern Saskatchewan.	73
50. Evaluating the potential of the Deadwood-Winnipeg and Interlake formations for the disposal of postash brines.	73
51. Investigation of the permeability structure of potash tailings piles.	73
52. Development of 3-dimensional seismic reflection techniques to survey prospective ore panels.	23
53. Surface photo-lineament studies as an aid to identifying sub-surface geology.	23
54. Study of mine decommissioning options in respect to environmental matter.	126
55. Exploration technology such as mineralogy, geology, geochemistrty, X-ray diffraction and other related subjects.	126
56. Study of permeability of glacial fills and related ground water flow characteristics.	126
57. Environmental and ground water characteristics associated with potash mining operations.	126

PROJECT TITLE / TITRE DU PROJET	PAGE
58. Reclamation work on tailings dams and waste dumps, including resloping and seeding.	7
59. Evaluation of the effects of water flowing through surface waste rock dumps/piles.	7
60. Waste management for oil sands mines.	85
61. Properties of geomaterials.	85
62. Hydrogeochemical investigations of the INCO mine tailings area, Sudbury, Ontario.	85
63. Development of a laboratory procedure for evaluating the effectiveness of reactive tailings covers.	86
64. Reduction of acid generation in mine tailings through the use of moisture retaining cover layers as oxygen barriers.	86
65. A laboratory investigation of the kinetic controls on copper and zinc concentrations in sulphide tailings.	86
66. Operations research for surface coal and oil sands mines, such as: time studies, computer simulation, equipment performance and computerized control technology.	124
67. Spontaneous combustion evaluation and control technologies for coal and coal products during mining, processing, transportation and storage.	124
68. Geotechnical engineering for surface coal and oil sands mines (pit walls, dumps, tailings dams etc.).	124
69. Biological treatment of recycled water.	56
70. Monitoring particle velocity (vibration) during the mining of surface crown pillar stopes using 6.5 in diam. long holes.	61

PROJECT TITLE / TITRE DU PROJET	PAGE
71. Statistical study of the distribution of mineral samples (Au) in draw points.	61
72. Design and construction of a treatment plant for used mill/mine water.	60
73. Design, installation and commissioning of an effluent treatment plant for a 1250 ton-per-day gold mill.	35
74. Tailings reclamation using dredging and dry excavation.	35
75. Removal of high (over 20 m) post-pillars from an existing open room and pillar stoping area (equipment and ground control considerations).	13
76. Installation of piezometers to monitor the water table levels in relation to final pit walls/slopes.	63
77. Surface geophysical techniques for foothills and mountain coalfield exploration.	123
78. Downhole geophysics.	123
79. Automated flocculation stations located on water courses draining out of the mine property.	14
80. Radionuclides in mammals living in drainage systems associated with uranium mine tailings.	76
81. Radionuclides transferred from mothers to offspring.	76
82. Monitoring of nitrogen status and nitrogen fixing capacity of soils rendered barren by industrial activity and/or revegetated for reclamation purposes.	76
83. Shotcrete for rockburst protection.	111

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84. Investigate the geotechnical feasibility of developing an injection well in the Moncton sub-basin for disposal of excess brine from the potash milling operation. 67

85. The study and predictive modelling of subsidence induced by potash mining. 67

86. Optimization of blasting operations in open pit mining. 52

87. Use of expert systems in the management of tailings pulp density. 52

88. Study and evaluation of the implications of waste management of concentrating the slimes associated with uranium and non uranium tailings. 128

89. Radionuclide concentration in fish: Phase I-Screening Program. 128

90. Assessing gold recovery at Klondike placer mines with radiotracers (1989) Preliminary Summary. 104

91. Gold losses at Klondike placer mine. 104

4. DESIGN

	PROJECT TITLE / TITRE DU PROJET	PAGE
1.	Design criteria for pillars in coal mines.	70
2.	Voussoir beam analysis and its application to roof design of stratified deposits.	70
3.	Cutter roof failure in coal mines - investigation of theoretical conditions, modelling results and comparison with case histories.	70
4.	Design of artificial supports for footwall bedded slopes with particular attention to counteracting the 'buckling' failure mode.	70
5.	Integrated shovel and drill monitoring system.	11
6.	Development of PNET program for project scheduling.	68
7.	Development of a file of mine service planning computer models that are compatible with the IBM-PC.	68
8.	The influence of rock mechanics considerations on mine design and short-and long-term stability.	15
9.	Continuation of study to develop better mechanized mining methods for use in low dipping (20 to 40 deg.) pillar recovery mining operations.	9
10.	An evaluation of the Lynx 3D computer modelling system for use in mine planning and engineering services.	9
11.	Optimization of blast design for blasthole mining operations.	20
12.	Development of a geomechanical database and numerical model for predicting ground behaviour at depth.	20
13.	Vertical blasthole mining (VBM) design guidelines for steeply dipping ore bodies, hang-up removal and scaling techniques.	20

PROJECT TITLE TITRE DU PROJET	PAGE
14. Open pit simulation studies.	81
15. Computerized open pit feasibility and design.	81
16. Pit slope stability studies.	81
17. Use of total tailings for backfill support.	81
18. Assessment of quality control parameters influencing in situ backfill competence.	81
19. Long term subsidence prediction in potash extraction operations based on field monitoring, laboratory measurements and computer modelling.	81
20. Use of chemical gelling agents as cement replacement materials in backfills.	81
21. Reconciliation of grade control and production statistics with geostatistically defined ore reserves and mineral inventories.	83
22. Open pit mine design and production scheduling using microcomputers and CAD systems.	82
23. Underground stope layout and mine design using microcomputers and CAD systems.	82
24. Development and verification of computcrized cut-and-fill panel design.	44
25. Tripartite rockburst research program: Canada (CANMET), Ontario and Ontario mining industry: Investigating stability and rockburst activity in mines.	130
26. Research to increase potash recoveries in Canadian mines.	132

PROJECT TITLE / TITRE DU PROJET	PAGE
27. Developing a handbook for the safe and economic design of surface crown pillars.	132
28. Study of mining methods relative to Canadian and non-canadian mines exploiting narrow veined ore bodies.	137
29. Development of a 3D mine planning and design software package for operating mines.	137
30. Developing data bank and understanding of fault slip rockbursts using full seismic waveform analysis, 2 and 3D modelling and tomographic imaging.	31
31. Developing stability graph approach to design post pillar cut-and-full stopes.	31
32. Computer aided design for optimum mine planning.	30
33. Mechanical behaviour of salt fines under weak confining stresses.	89
34. Optimization of open pit mining limits (final pit walls).	91
35. Final underground mining limits; optimization of underground operations.	91
36. Preparation of a 'Technical guide for grouted cable bolts used as ground support'.	98
37. Improvement of subroutine DISCO (solving principal stresses along discontinuity planes) to account for progressive failures, blasting effects and spacing/size of discontinuities.	98
38. Utilisation of SUN 30 work station in the teaching of CAD techniques.	98
39. Optimization of production planning in open pit mines.	99

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40. Expert systems.	99
41. Expert system development for mine design/control.	92
42. Design techniques for steel support in mine tunnels.	92
43. Design a method of cut-and-fill for post pillar mining.	92
44. Stability of gate roadways in underground coal mines.	92
45. Pillar support mechanisms.	94
46. Slope stability and slope reinforcement.	94
47. Design and analysis of underground steel support systems.	95
48. Measurement of vertical movement on a bench by hydrostatic levelling equipment.	49
49. Computerization of mine planning and design.	49
50. Developing mining sequences for ore reserves located in a part of a mine subject to rockburst.	54
51. Compile and edit a manual on the criteria, parameters and techniques for the planning and design of open pit mines.	142
52. Establishing a centre for mine ventilation calculations and simulation to service Québec mines.	142
53. Studying methods for establishing the dimensions of u/g openings.	143
54. Optimization of underground stope blast design.	119
55. Ground support optimization using cable support techniques for stabilizing mining excavations. Laboratory work backed by field applications.	119

PROJECT TITLE / TITRE DU PROJET	PAGE
56. Development of a portable OTDR convergence meter for use in mine development operations.	120
57. To design and test an underground radio warning system.	121
58. To develop and test mine-wide monitoring systems.	121
59. To investigate the use of electro-magnetic waves to locate drill holes.	121
60. To investigate the benefit of force feedback to remote control operation.	121
61. Development of a blasthole deviation monitor.	121
62. Development of a blast monitoring system.	121
63. Development of controlled blasting.	121
64. Design of crown pillars.	116
65. Underground testing of a mining method for a very high-grade uranium deposit.	17
66. Design and develop decline to provide a shaft spillage mucking facility.	45
67. Design and develop decline to access ancilliary ore body.	45
68. Sub-level open stoping being introduced on 3930 level.	45
69. Sub-level caving below the 3510 level.	45
70. Design and develop truck haulage and ore pass systems.	45
71. Computerized surveying system for EDM using AUTOCAD to update mine plan and store survey pick-ups.	7

PROJECT TITLE / TITRE DU PROJET	PAGE
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Readers are invited to comment on this document. Such comments will be appreciated and will be examined prior to compiling future issues.

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